

AD-A207 021

FINAL REPORT
January 1988

REPORT NO. EVT 11-88

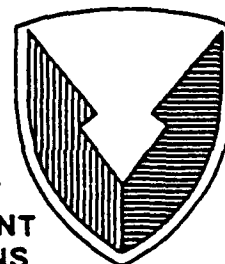
MIL-STD-1660 TEST
OF
40MM STANDARD PALLET
and
TOP-LIFT ADAPTER

Prepared for:
U.S. Army Armament Research,
Development and Engineering
Center

This document has been approved
for public release and sales in
distribution is unlimited.

EVALUATION DIVISION
SAVANNA, ILLINOIS 61074-9639

DTIC
ELECTE
APR 24 1989
S E D



US ARMY
ARMAMENT
MUNITIONS
CHEMICAL COMMAND

US ARMY DEFENSE AMMUNITION
CENTER AND SCHOOL

089 4 24 173

AVAILABILITY NOTICE

A copy of this report is furnished each attendee on automatic distribution. Additional copies or authority for reprinting may be obtained by written request from Director, U.S. Army Defense Ammunition Center and School. ATTN: SMCAC-DEV, Savanna, IL 61074-9639.

DISTRIBUTION INSTRUCTIONS

Destroy this report when no longer needed. Do not return.

* * *

Citation of trade names in this report does not constitute an official endorsement.

* * *

The information contained herein will not be used for advertising purposes.

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE

ADA207021

REPORT DOCUMENTATION PAGE				Form Approved OMB No. 0704-0188	
1a. REPORT SECURITY CLASSIFICATION UNCLASSIFIED			1b. RESTRICTIVE MARKINGS		
2a. SECURITY CLASSIFICATION AUTHORITY			3. DISTRIBUTION / AVAILABILITY OF REPORT UNLIMITED		
2b. DECLASSIFICATION / DOWNGRADING SCHEDULE					
4. PERFORMING ORGANIZATION REPORT NUMBER(S) EVT 11-88			5. MONITORING ORGANIZATION REPORT NUMBER(S)		
6a. NAME OF PERFORMING ORGANIZATION U.S. Army Defense Ammunition Center and School		6b. OFFICE SYMBOL (If applicable) SMCAC-DEV	7a. NAME OF MONITORING ORGANIZATION		
6c. ADDRESS (City, State, and ZIP Code) Savanna, IL 61074-9639			7b. ADDRESS (City, State, and ZIP Code)		
8a. NAME OF FUNDING / SPONSORING ORGANIZATION U.S. Army Armament, Research, Development and Engineering Center		8b. OFFICE SYMBOL (If applicable) SMCAR-ESK	9. PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER		
8c. ADDRESS (City, State, and ZIP Code) Picatinny Arsenal, NJ 07801-5001			10. SOURCE OF FUNDING NUMBERS		
		PROGRAM ELEMENT NO.	PROJECT NO.	TASK NO.	WORK UNIT ACCESSION NO.
11. TITLE (Include Security Classification) MIL-STD-1660 Test of 40mm Standard Pallet and Top-Lift Adapter					
12. PERSONAL AUTHOR(S) A. C. McIntosh, Jr					
13a. TYPE OF REPORT FINAL		13b. TIME COVERED FROM _____ TO _____		14. DATE OF REPORT (Year, Month, Day) 1988 January	
15. PAGE COUNT 86					
16. SUPPLEMENTARY NOTATION					
17. COSATI CODES			18. SUBJECT TERMS (Continue on reverse if necessary and identify by block number)		
FIELD	GROUP	SUB-GROUP	MIL-STD-1660 40mm Ammunition Containers, (S)		
			Standard Pallets,		
			Top-Lift Adapters,		
19. ABSTRACT (Continue on reverse if necessary and identify by block number)					
<p>The U.S. Army Defense Ammunition Center and School (USADACS) Evaluation Division (SMCAC-DEV), has been tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC), SMCAR-AEP, Picatinny Arsenal, NJ to design, fabricate, and test a metal pallet for the 40mm ammunition container. This report contains the results of the MIL-STD-1660, Design Criteria for Ammunition Unit Loads, testing sequence applied to the 40mm ammunition container. The results of these tests indicate that the pallet unitization designed satisfied the testing requirements. (K. McIntosh, Jr)</p>					
20. DISTRIBUTION / AVAILABILITY OF ABSTRACT <input checked="" type="checkbox"/> UNCLASSIFIED/UNLIMITED <input type="checkbox"/> SAME AS RPT. <input type="checkbox"/> DTIC USERS			21. ABSTRACT SECURITY CLASSIFICATION UNCLASSIFIED		
22a. NAME OF RESPONSIBLE INDIVIDUAL THOMAS J. MICHELS, Chief, Evaluation Division			22b. TELEPHONE (Include Area Code) AV 585-8928 (815)		22c. OFFICE SYMBOL SMCAC-DEV

U.S. ARMY DEFENSE AMMUNITION CENTER AND SCHOOL
Evaluation Division
Savanna, IL 61074-9639

REPORT NO. EVT 11-88

MIL-STD-1660 TEST
OF
40MM STANDARD PALLET AND TOP-LIFT ADAPTER

TABLE OF CONTENTS

PART	PAGE NO.
1. INTRODUCTION	1-1
A. Background	1-1
B. Authority.	1-1
C. Objective.	1-1
2. ATTENDEES.	2-1
3. TEST PROCEDURES.	3-1
4. TEST EQUIPMENT	4-1
5. TEST RESULTS	5-1
6. CONCLUSIONS AND RECOMMENDATIONS	6-1
7. PHOTOGRAPHS.	7-1
8. DESIGN DRAWINGS.	8-1
9. TEST DATA.	9-1

Accession For	
NTIS GRA&I	<input checked="" type="checkbox"/>
DTIC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/	
Availability Codes	
Dist	Avail and/or Special
A-1	



PART 1

INTRODUCTION

A. BACKGROUND. The U.S. Army Defense Ammunition Center and School, Evaluation Division, was tasked by the U.S. Army Armament Research, Development and Engineering Center (ARDEC) to design, fabricate, and test a metal unitization for the 40mm ammunition container. The test procedure for evaluating this unitization is MIL-STD-1660.

B. AUTHORITY. This test was conducted in accordance with mission responsibilities delegated by the U.S. Army Armament Research, Development and Engineering Center, Picatinny Arsenal, NJ.

C. OBJECTIVE. The objectives of these tests are to assess the 40mm ammunition container capability to meet Army functional/operational requirements of MIL-STD-1660, Design Criteria for Ammunition Unit Loads.

PART 2

ATTENDEES

Mr. A. C. McIntosh, Jr.
General Engineer
AV 585-8989

Director
U.S. Army Defense Ammunition Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Mr. Gayle T. Zajicek
Test Engineer
AV 585-8929

Director
U.S. Army Defense Ammunition Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Mr. David V. Valant
Electronic Technician
AV 585-8988

Director
U.S. Army Defense Ammunition Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

Mr. Quinn D. Hartman
General Engineer
AV 585-8988

Director
U.S. Army Defense Ammunition Center and School
ATTN: SMCAC-DEV
Savanna, IL 61074-9639

PART 3

TEST PROCEDURES

The test procedures outlined in this section are extracted from MIL-STD-1660, Design Criteria for Ammunition Unit Loads, 8 April 1977. This standard identifies nine steps that a unitized load must undergo if it is considered to be acceptable. These tests are synopsized below:

1. STACKING TESTS. The unit load shall be loaded to simulate a stack of identical unit loads stacked 16 feet high, for a period of one hour. This stacking load is simulated by subjecting the unit load to a compression of weight equal to an equivalent 16 foot stacking height. The compression load is calculated in the following manner. The unit load weight is divided by the unit load height in inches and multiplied by 192. The resulting number is the equivalent compressive force of a 16 foot high load.
2. REPETITIVE SHOCK TEST. The repetitive shock test shall be conducted in accordance with Method 5019, Federal Standard 101. The test procedure is as follows. The test specimen shall be placed on, but not fastened to, the platform. With the specimen in one position, vibrate the platform at 1/2 inch amplitude (1-inch double amplitude) starting at a frequency of about 3 cycles per second. Steadily increase the frequency until the package leaves the platform. The resonant frequency is achieved when a 1/16-inch-thick feeler may be momentarily slid freely between every point on the specimen in contact with the platform at some instance during the cycle or a platform acceleration achieves one plus or minus zero point one G. Midway into the testing period the specimen shall be rotated 90 degrees and the test continued for the duration. If failure occurs, the total time of vibration shall be two hours

if the specimen is tested in one position; and if tested in more than one position, the total time shall be three hours.

3. EDGEWISE DROP TEST. This test shall be conducted by using the procedures of Method 5008, Federal Standard 101. The procedure for the Edgewise Drop (Rotational) Test is as follows: The specimen shall be placed on its bottom with one end of the base of the container supported on a sill nominally 6 inches high. The height of the sill shall be increased if necessary to ensure that there will be no support for the base between the ends of the container when dropping takes place, but should not be high enough to cause the container to slide on the supports when the dropped end is raised for the drops. The unsupported end of the container shall then be raised and allowed to fall freely to the concrete, pavement, or similar underlying surface from a prescribed height. Unless otherwise specified, the height of drop for level A protection shall conform to the following tabulation.

GROSS WEIGHT NOT EXCEEDING	DIMENSIONS ON ANY EDGE NOT EXCEEDING	HEIGHT OF DROP LEVEL A PROTECTION
Pounds	Inches	Inches
600	72	36
3,000	no limit	24
no limit	no limit	12

4 FORKLIFTING TEST. This test shall be conducted by using the procedures of Method 5011 of Federal Standard 101, Procedure 6.2, Lifting and Transporting by Forklift Truck. The forklift hazard course that will be used is shown in Figure 1. The procedure for the lifting and transporting by forklift truck test is as follows. The specimen shall be lifted clear of the ground by a forklift truck at one side of the specimen and transported on the forks in

the level or back tile position across the alternate hazard course. The forklift must carry the specimen over the hazard course in about 23 seconds and then shall be brought to a stop. The specimen shall be carefully observed during the traverse and while the forklift is at a stop for any damage, evidence of inadequacy, or deflection of the specimen that might cause damage or displacement of the contents. The specimen shall be then lowered onto the ground. The forklift shall be moved from the side to the end of the specimen. The forks shall be run under the specimen as far as possible and then operated to lift the end 6 inches. Observe the specimen, particularly in the vicinity of the ends of the forks and record observations. If the specimen can thus be lifted clear of the floor, transported on the forks over the same hazard course and record observation. If it cannot be thus lifted, report the length of forks used and state that the specimen could not be carried on the forklift truck at either end.

5. SLING COMPATIBILITY TEST. Unit loads utilizing special design for non-standard pallets shall be lifted, slung, lowered, and otherwise handled as necessary using slings of the types normally used for handling the unit loads under consideration. Slings shall be easily attached and removed. Danger of slippage or disengagement when load is suspended shall be cause for rejection of the unit load.

6. IMPACT TEST. This test shall be conducted by using the procedure of Method 5023, Incline-Impact Test of Federal Standard 101. The procedure for the Incline-Impact Test is as follows:

The specimen shall be placed on the carriage with the surface or edge which is to be impacted projecting at least 2 inches beyond the front end of the carriage. The carriage shall be brought to a predetermined position on the

incline and released. If it is desired to concentrate the impact on any particular position on the container, a 4x4 inch timber may be attached to the bumper in the desired position before the test. No part of the timber shall be struck by the carriage. The position of the container on the carriage and the sequence in which surfaces and edges are subjected to impacts may be at the option of the testing activity and will depend upon the objective of the tests. When the test is to determine satisfactory requirements for a container or pack and unless otherwise specified the specimen shall be subjected to one impact on each surface that has each dimension less than 9.5 feet. Unless otherwise specified, the velocity at time of impact shall be 7 feet per second.

PART 4
TEST EQUIPMENT

1. TEST SPECIMEN.

- a. Width: 45-1/2 inches
- b. Length: 41 inches
- c. Height: 37 inches
- d. Weight: 2,015 pounds

2. COMPRESSION TESTER.

- a. Manufacturer:
- b. Platform: 60 inches by 60 inches
- c. Compression Limit: 50,000 pounds
- d. Tension Limit: 50,000 pounds

3. TRANSPORTATION SIMULATOR.

- a. Manufacturer: Gaines Laboratory
- b. Capacity: 6,000 pound pallet
- c. 1/2-inch Amplitude
- d. Speed: 50 to 3000 cpm
- e. Platform: 5 foot by 8 foot

4. INCLINED RAMP.

- a. Manufacturer: Conbur Incline
- b. Impact Tester
- c. 10% Incline
- d. 12-foot Incline

PART 5
TEST RESULTS

1. STACKING TEST.

Pallet Weight - 2,015 pounds

Pallet Height - 37 inches

Test Load - 10,473 pounds

Subject pallet was loaded to 10,500 pounds compression for a period of one hour. At the end of this period of time the compressor's load had decreased to 9,900 pounds. When the compression load was removed and the test specimen removed from the compression tester, no measurable deformation in the load was evident.

2. REPETITIVE SHOCK TEST. Subject pallet successfully passed a longitudinal transportation simulation for a 90 minute period. Rotating the pallet 90 degrees and subjecting it to a second 90 minute period in the transportation simulator caused no damage to the pallet or strapping. In order to achieve a 1/16-inch clearance between the pallet and the transportation simulator bed equipment was operated at 200 rpm. The induced acceleration into the test specimen was 0.4 Gs.

3. EDGEWISE DROP TEST. Each side of the pallet base was placed on a beam displacing it six inches above the floor. The opposite side was raised to a height of 24 inches above the floor and then dropped. This process was repeated on all four sides of the pallet. No damage was caused to the pallet or the unit load at the completion of the edgewise drop test.

4. FORKLIFTING TEST. The forklifting test was accomplished while moving the pallet between test stations and storage building on gravel road. The

forks were engaged in the fork pockets provided on the pallet. Fork positions along the longitudinal and lateral sides of the pallet provide for stable movement from test station to test station.

5. SLING COMPATIBILITY TEST. The sling compatibility test consisted of lifting a pallet from the hoisting attachment provisions with a sling leg angle between 20 and 25 degrees. There were five lifts performed. The first lift was with all four hoisting provisions utilized; the second with three, the third with two diagonal hoisting provisions; the fourth with the two opposite diagonal hoisting positions; and the fifth with one hoisting position. All hoisting attachment provisions remained satisfactory throughout the test.

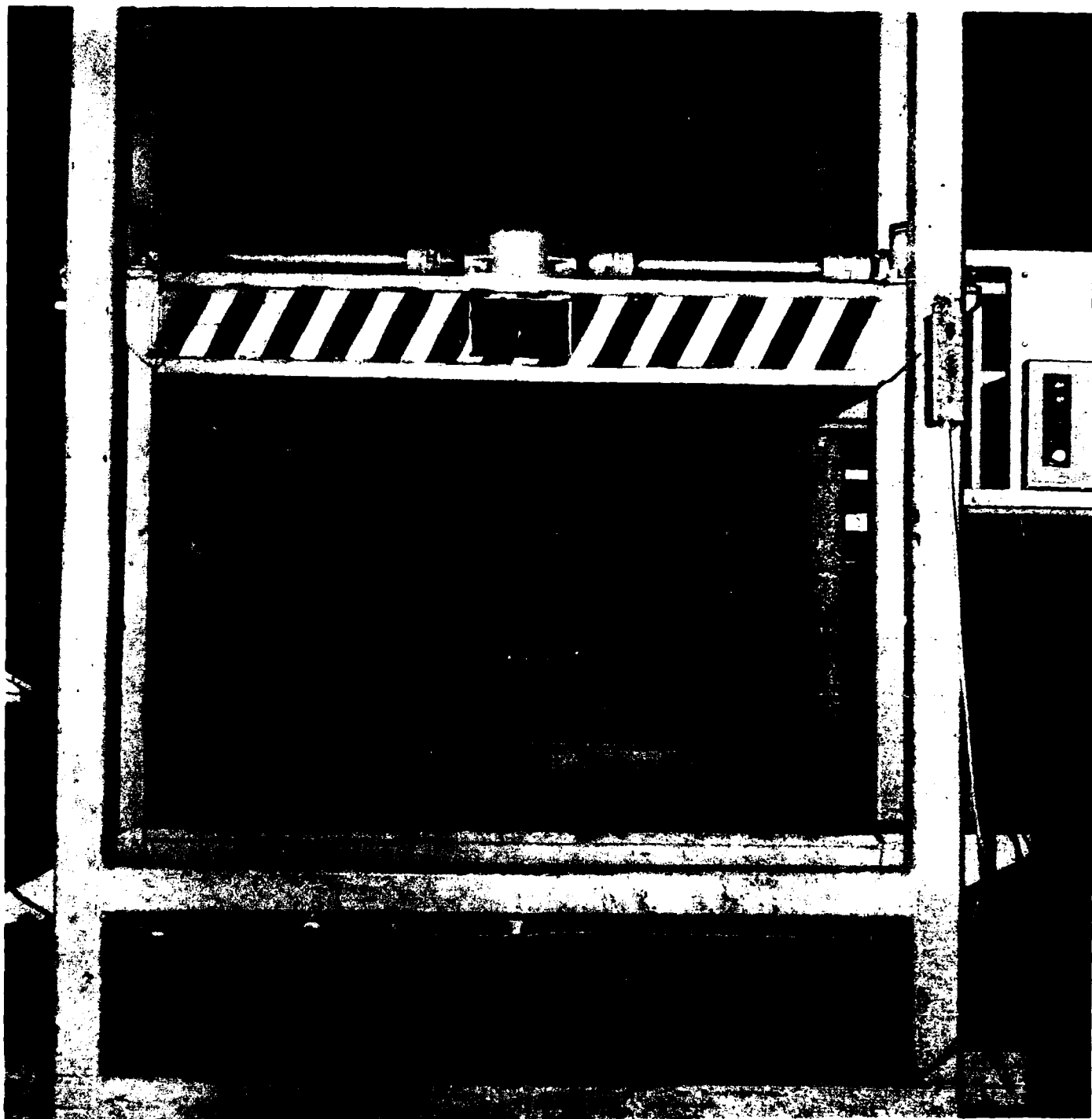
6. INCLINED IMPACT TEST. The inclined impact test consisted of placing the test pallet on an inclined sled with two inches of the pallet projecting over the impacting edge of the sled. The sled was then raised approximately 8 feet up the ramp and allowed to accelerate and impact into a solid wall. This test was repeated once on each side of the pallet. No damage was sustained by the four impacts of the inclined impact test

PART 6

CONCLUSIONS AND RECOMMENDATIONS

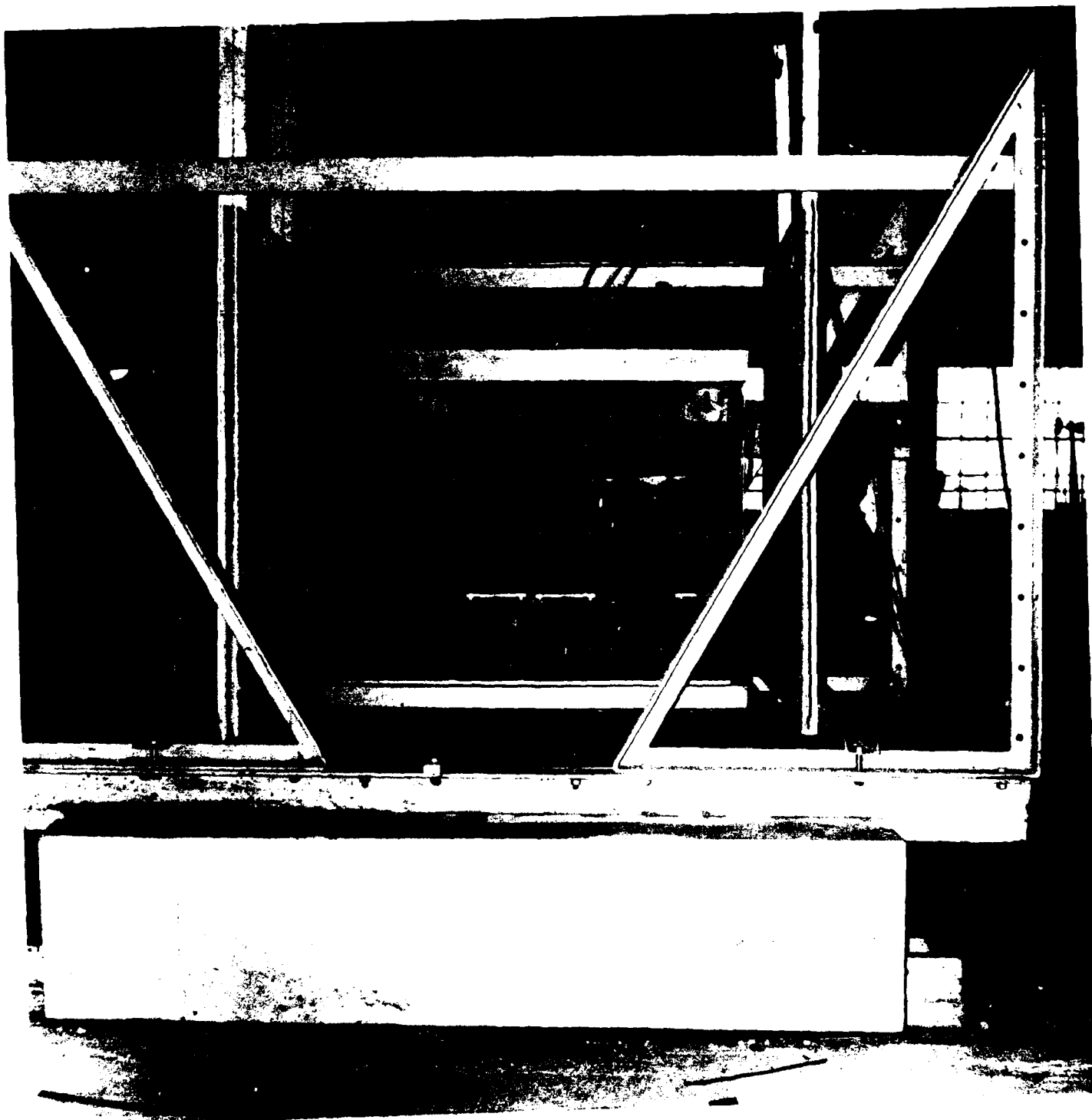
1. CONCLUSIONS. The 40mm ammunition containers as packed on a standard metal pallet with pallet adapter and top-lift attachment, satisfactorily passed all MIL-STD-1660 tests. Some deformation occurred on the ends of the pallet skids during the edgewise rotational drop tests. This, however, is not a cause for rejection since it does not result in an unsafe unitization procedure or cause unsafe handling.
2. RECOMMENDATIONS. It is recommended that the 40mm ammunition container pallet as configured in this test be accepted for the safe unitization, handling, storage, and transportation of ammunition.

PART 7
PHOTOGRAPHS



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 1. This photo shows the 40mm ammunition container on the standard metal pallet loaded to compression test load in the compression tester.



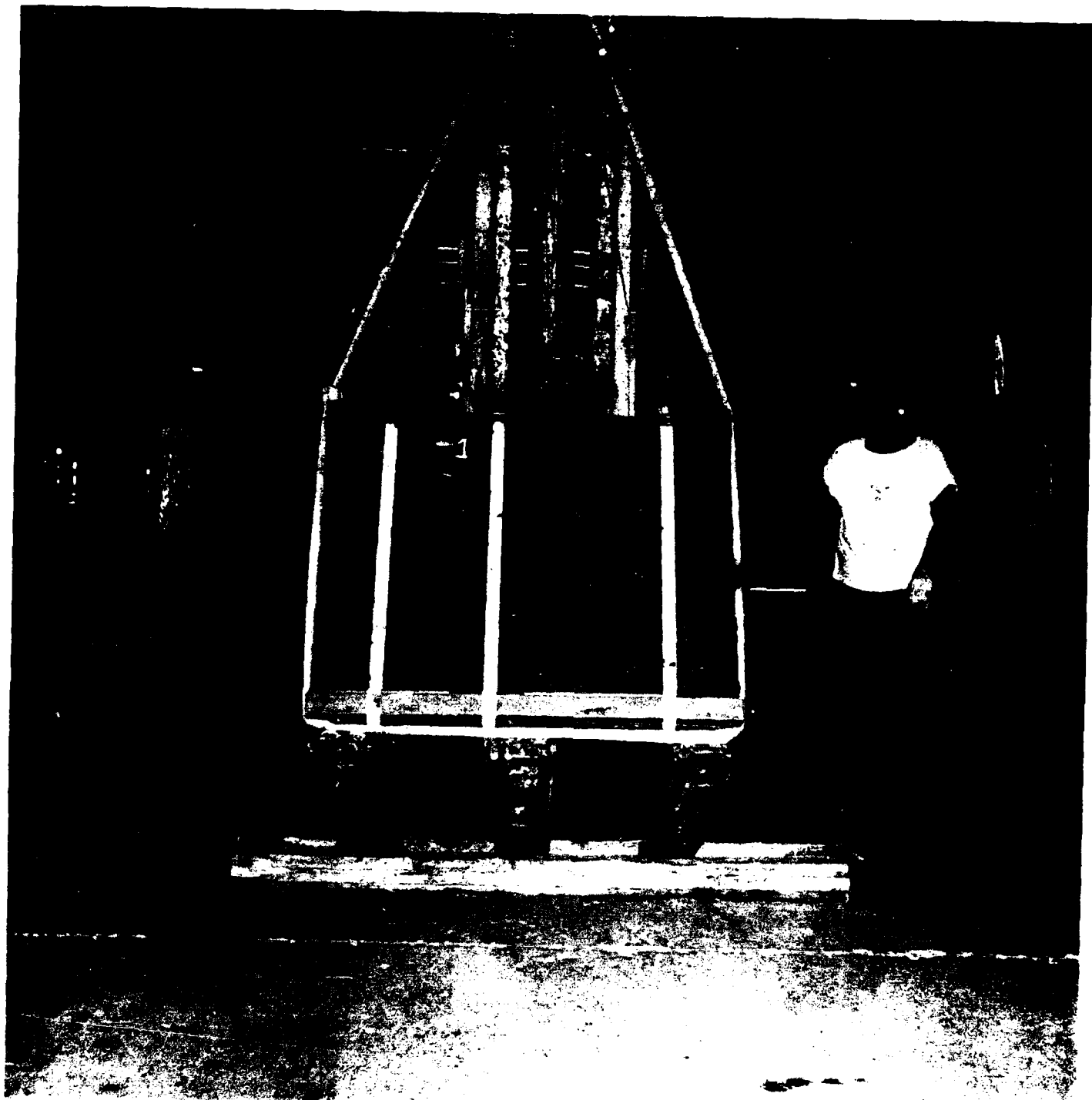
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 2. This photo shows the 40mm container ammunition pallet on the transportation simulator undergoing a mechanical vibration test.



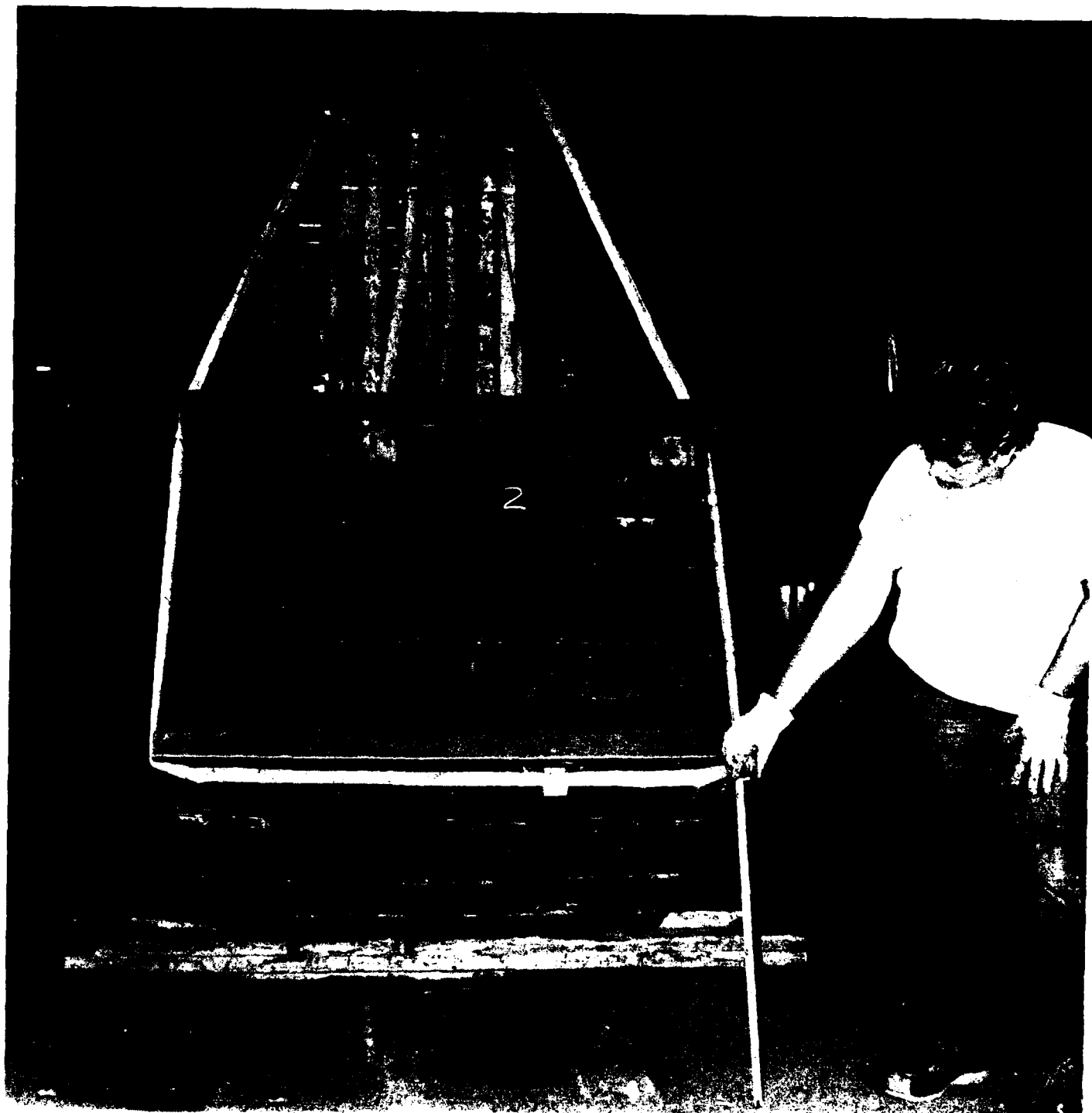
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 3. This photo shows one broken weld on the standard metal pallet as a result of the transportation simulation test.



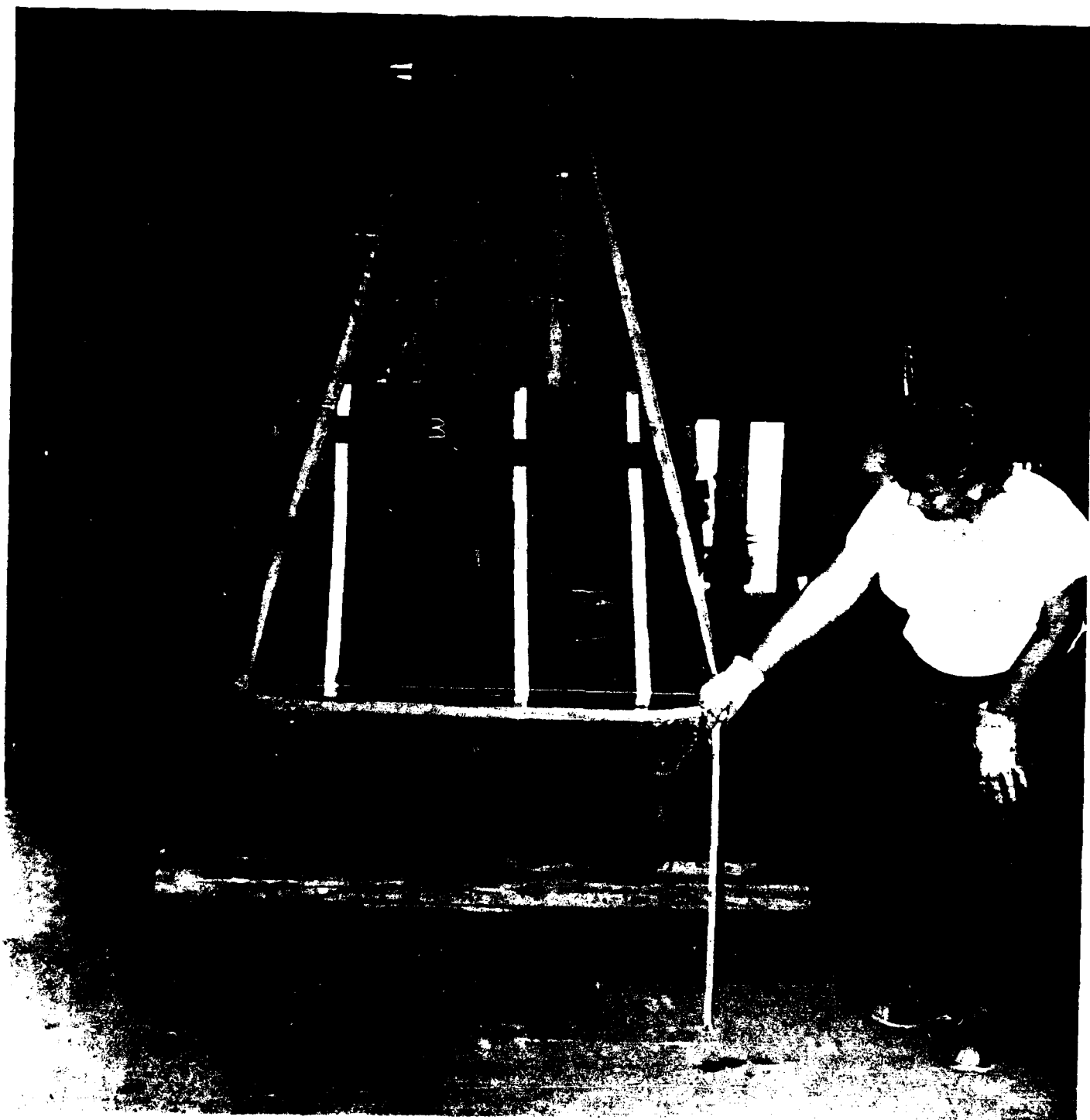
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 4. This photo shows the 40mm container ammunition pallet ready for the first edgewise rotational drop test.



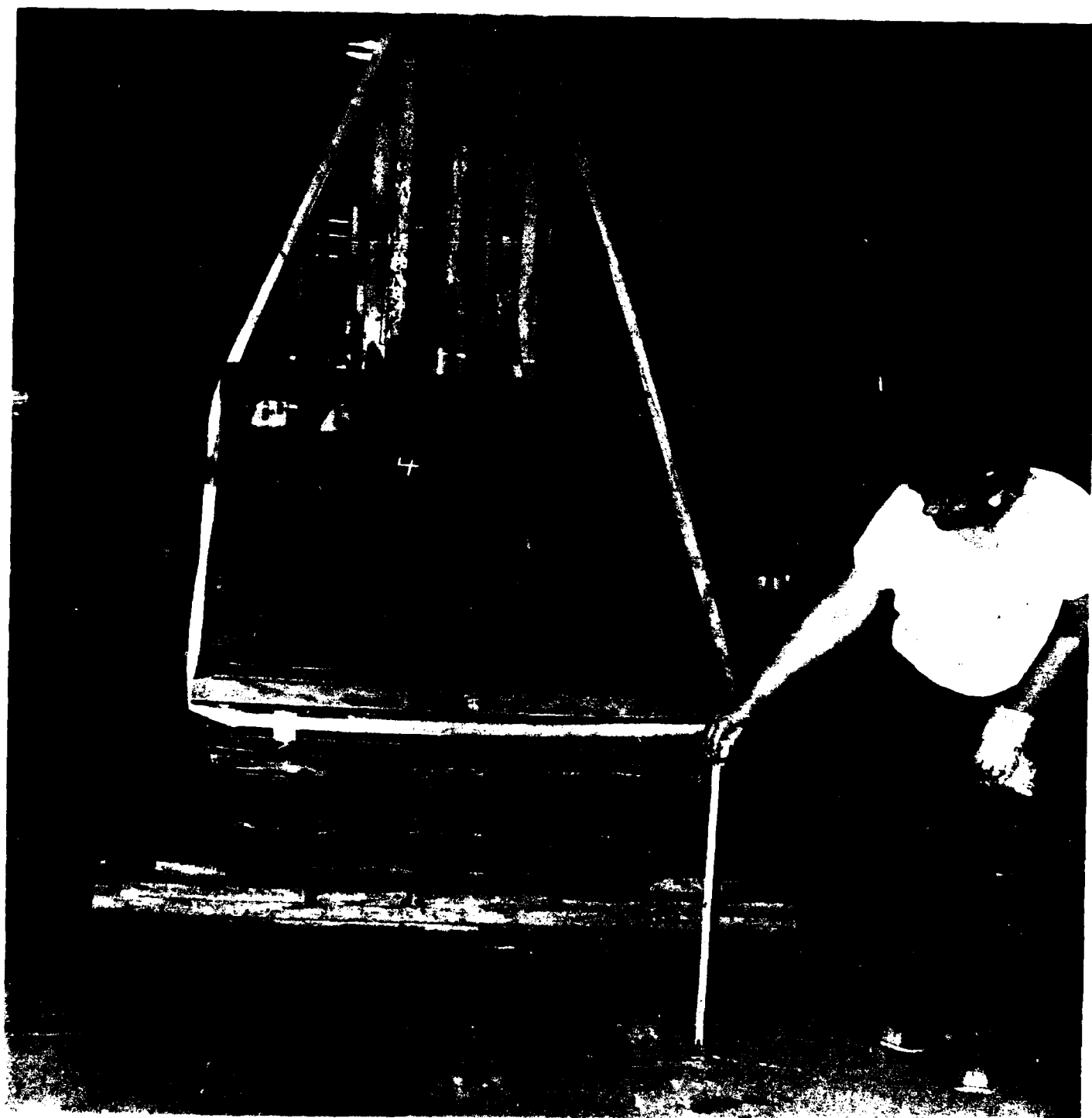
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 5. This photo shows the 40mm container ammunition pallet ready for the second edgewise rotational drop test.



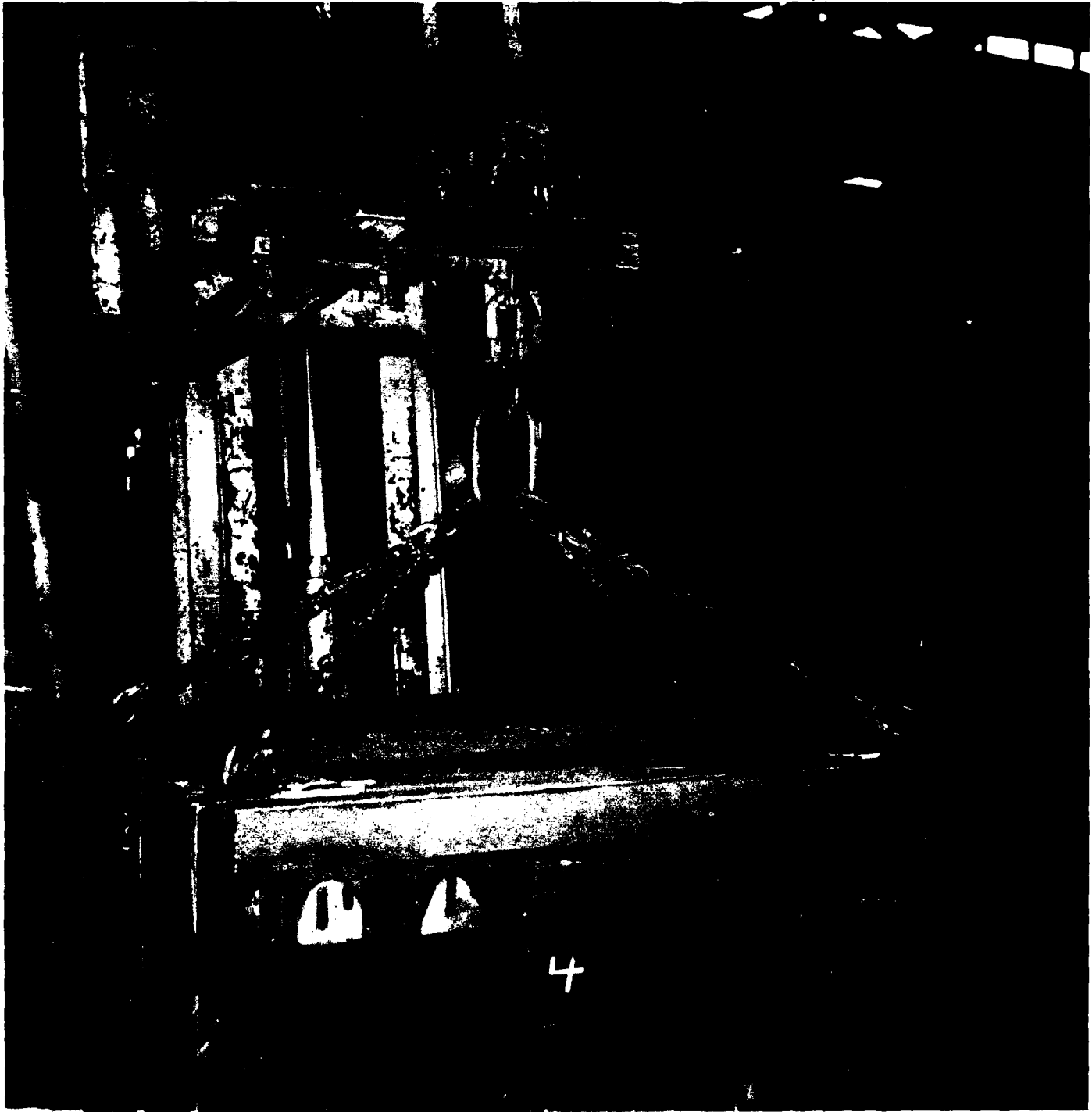
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 6. This photo shows the 40mm container ammunition pallet ready for the third edgewise rotational drop. Drop height is 24 inches.



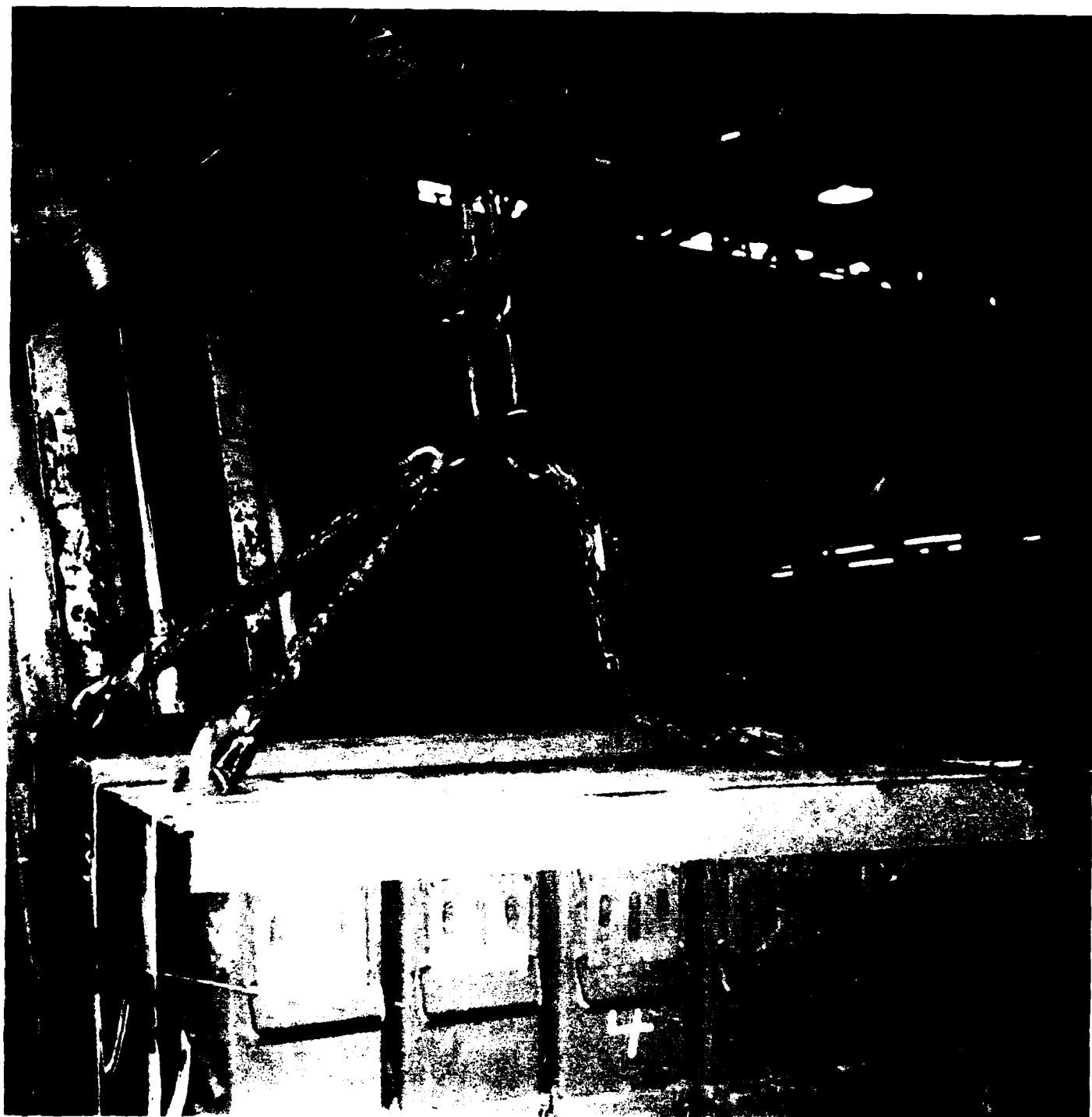
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 7. This photo shows the 40mm container ammunition pallet ready for the fourth and last edgewise rotational drop test.



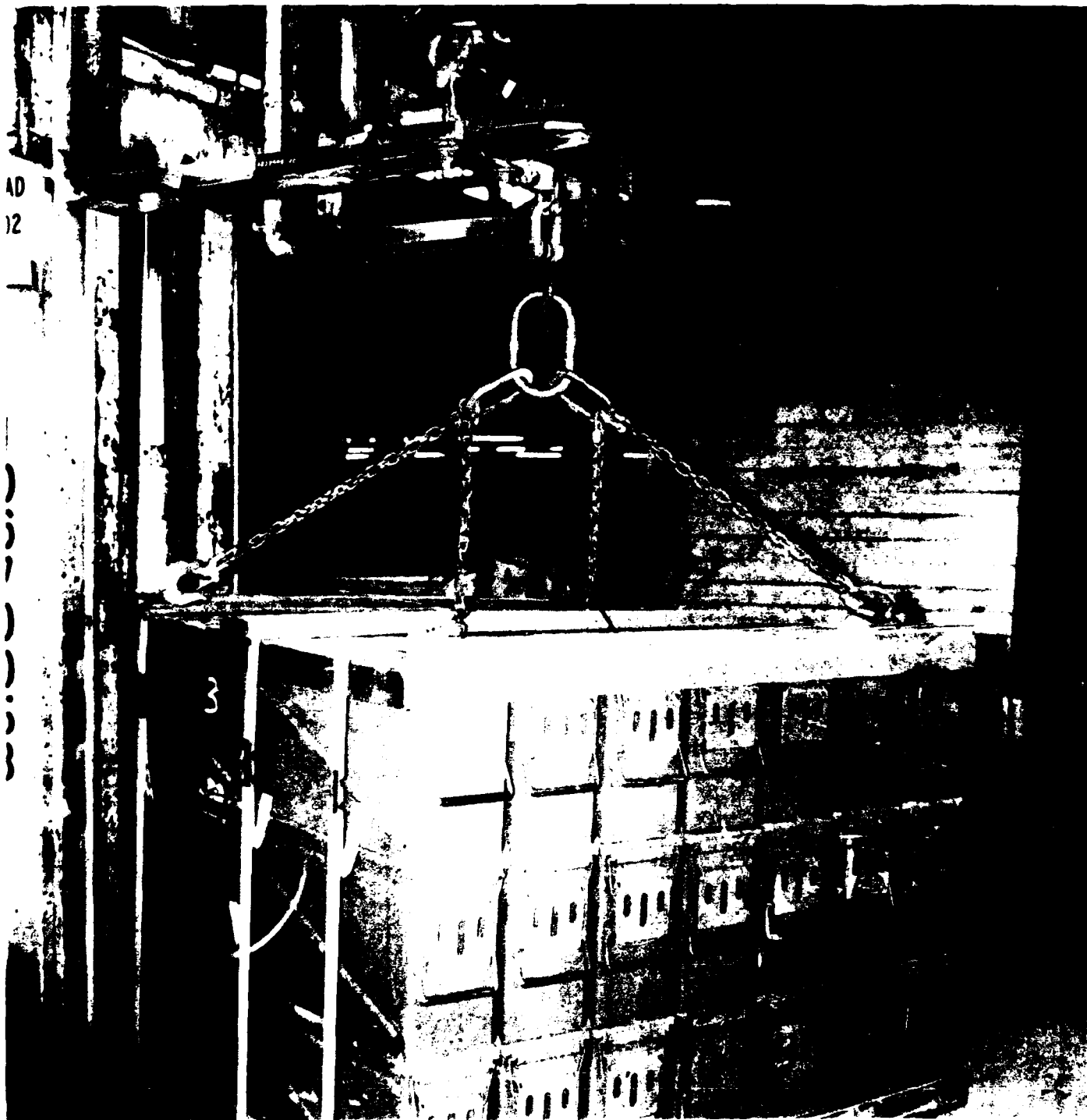
DEFENSE AMMUNITION CENTER AND SCHOOL- SAVANNA, IL

Photo No. 8. This photo shows the 40mm container ammunition pallet ready for the 4-legged mechanical handling test using a 4-legged sling for pick up from the handling attachments.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 9. This photo shows the 40mm container ammunition pallet being picked up by three legs from three of the sling attachment points.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 10. This photo shows the 40mm container ammunition pallet being lifted by two diagonal slings.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 11. This photo shows the 40mm container
ammunition pallet being picked up from a single slinging
attachment.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 12. This photo shows the 40mm container
ammunition pallet after the first inclined impact.



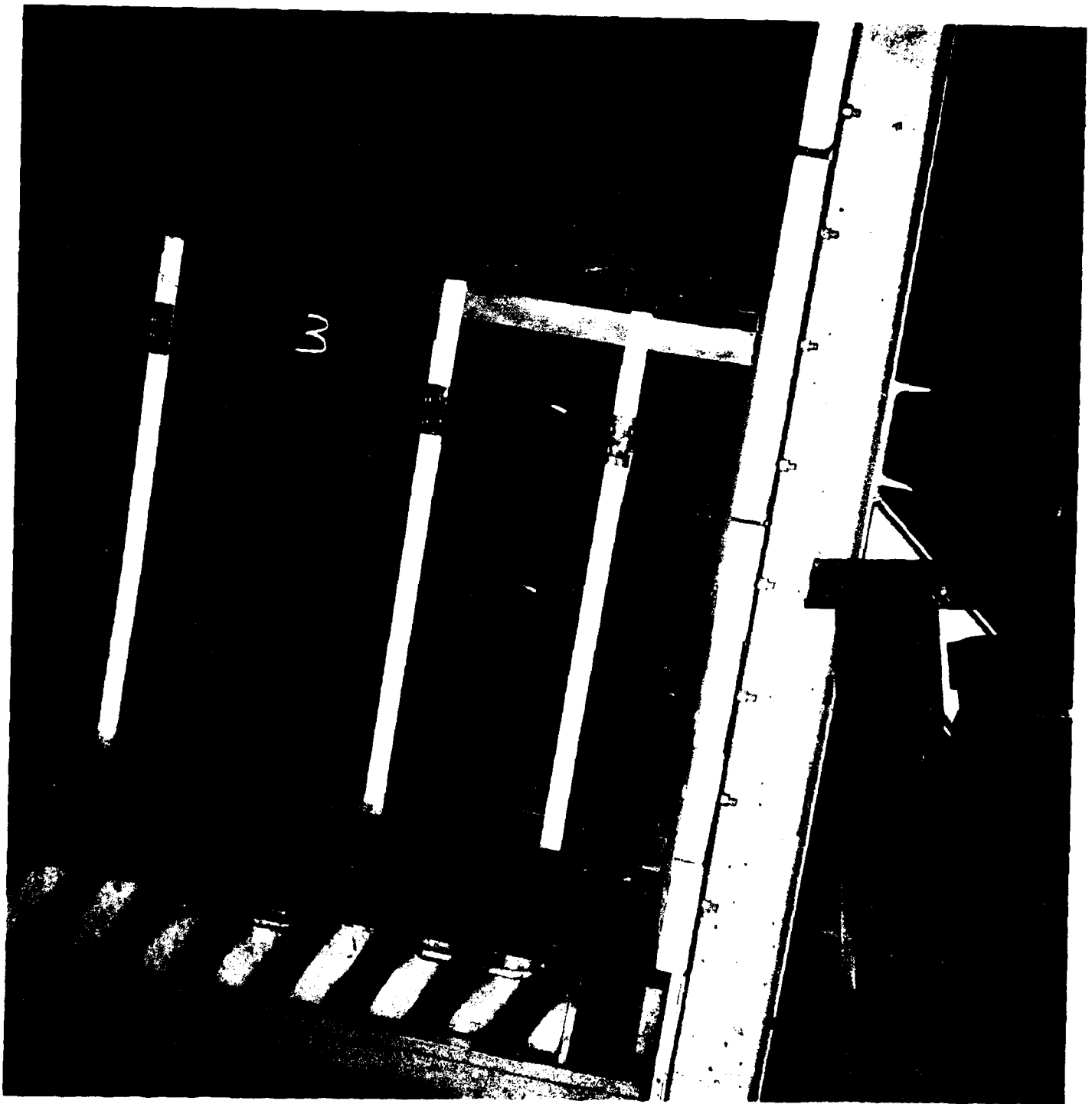
DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 13. This photo shows the 40mm container
ammunition pallet after the second inclined impact.



DEFENSE AMMUNITION CENTER AND SCHOOL - SAVANNA, IL

Photo No. 14. This photo shows the 40mm container
ammunition pallet after impact on the third side.



DEFENSE AMMUNITION CENTER AND SCHOOL- SAVANNA, IL

Photo No. 15. This photo shows the 40mm container
ammunition pallet after impact on the fourth and final side.

PART 8
DESIGN DRAWINGS

2.2.1.1

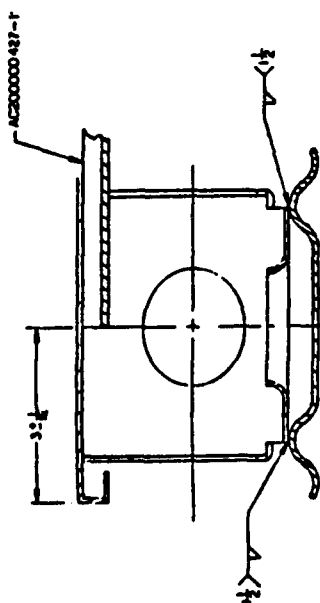
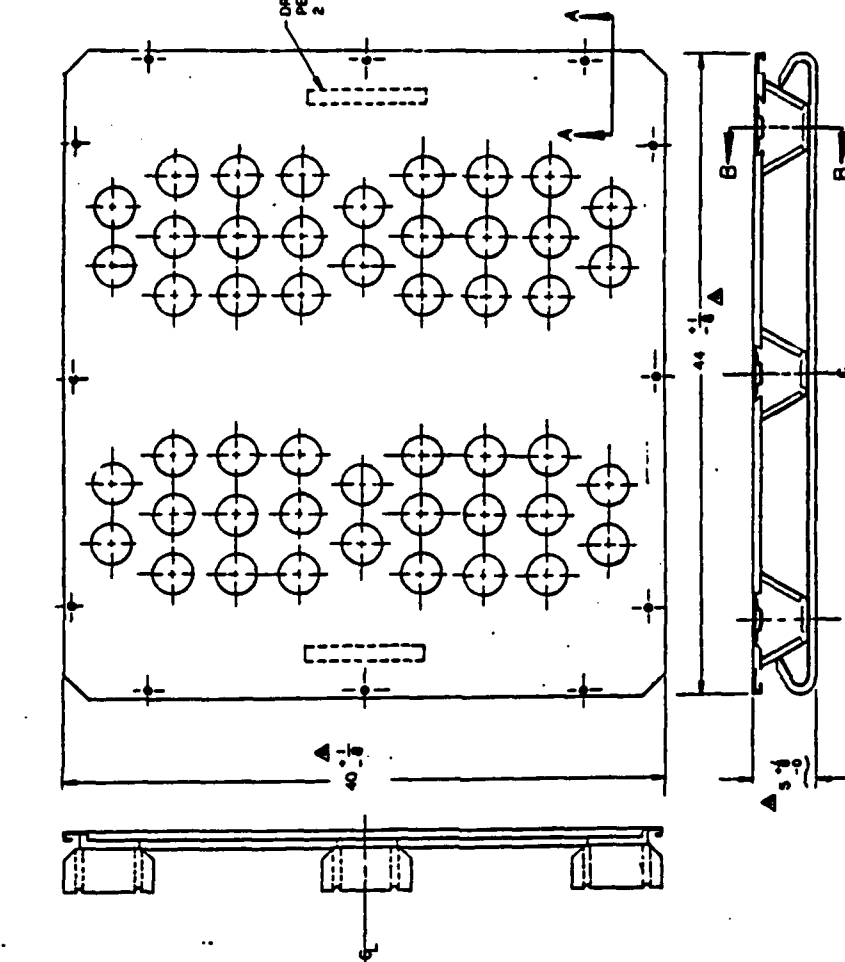
A LREDRAW DETAIL

2 ADD LENGTH TO WELD CALLOUTS

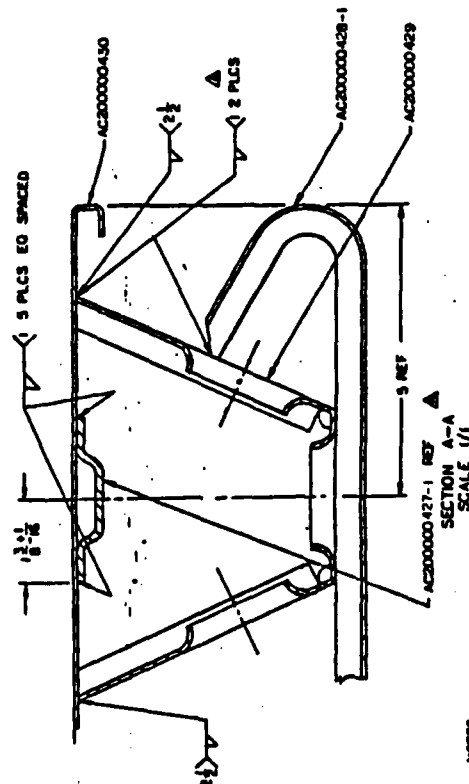
3. CHANGED DIMENSION

4 CHANGED TOLERANCE

DRAWING NO.
PER NOTE 3
2 PLACES



SECTION B-B
NOT TO SCALE

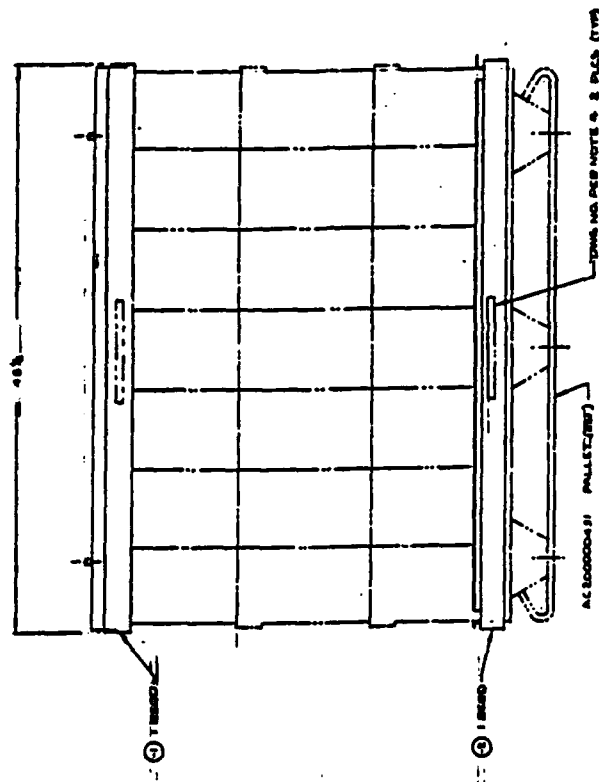


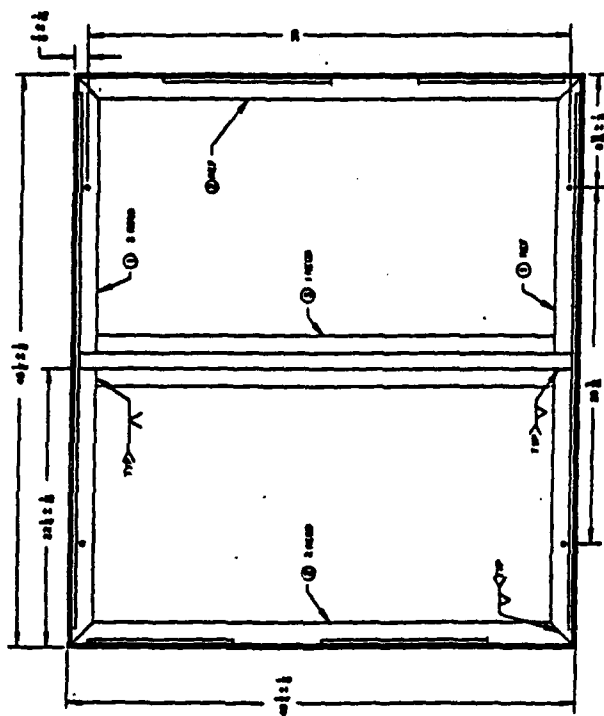
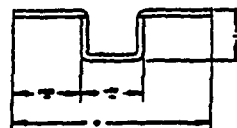
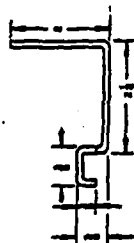
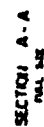
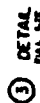
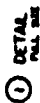
SECTION A-A
SCALE 1/1

Notes:

1. SPEC. ML-A-2550 AMERICAN WELDING SOCIETY STD. A 2.4-48 ASTM F44.3-68 APPLY
2. PROTECTIVE FINISH SHALL BE IN ACCORDANCE WITH DWG. AC200000423
COLOR SHALL BE GREEN NO. 343 PER MIL.-C-46464 IFED STD. 595 NO. 340561
3. MARKING SHALL BE IN ACCORDANCE WITH DWG. AC200000423
COLOR SHALL BE WHITE NO. 37875 1/4 INCH HIGH LETTERS

[illegible]

[illegible][illegible]



② BOTTOM FRAME ASSY

[illegible]

PART 9
TEST DATA

40mm Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 0 Minutes)

MEASUREMENT -----	MEAN -----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.262	.018
VERT. ACELL. ON SHAKER TABLE	.252	.011
LONG. ACELL. ON LOAD	.440	.113
LAT. ACELL. ON LOAD	.162	.077
VERT. ACELL. ON LOAD	.338	.038

40mm Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 22 Minutes)

MEASUREMENT -----	MEAN -----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.258	.018
VERT. ACELL. ON SHAKER TABLE	.232	.017
LONG. ACELL. ON LOAD	.891	.443
LAT. ACELL. ON LOAD	.266	.088
VERT. ACELL. ON LOAD	.382	.063

40mm Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 44 Minutes)

MEASUREMENT -----	MEAN ----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.253	.020
VERT. ACELL. ON SHAKER TABLE	.243	.014
LONG. ACELL. ON LOAD	1.037	.357
LAT. ACELL. ON LOAD	.007	.001
VERT. ACELL. ON LOAD	.360	.060

40mm Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 66 Minutes)

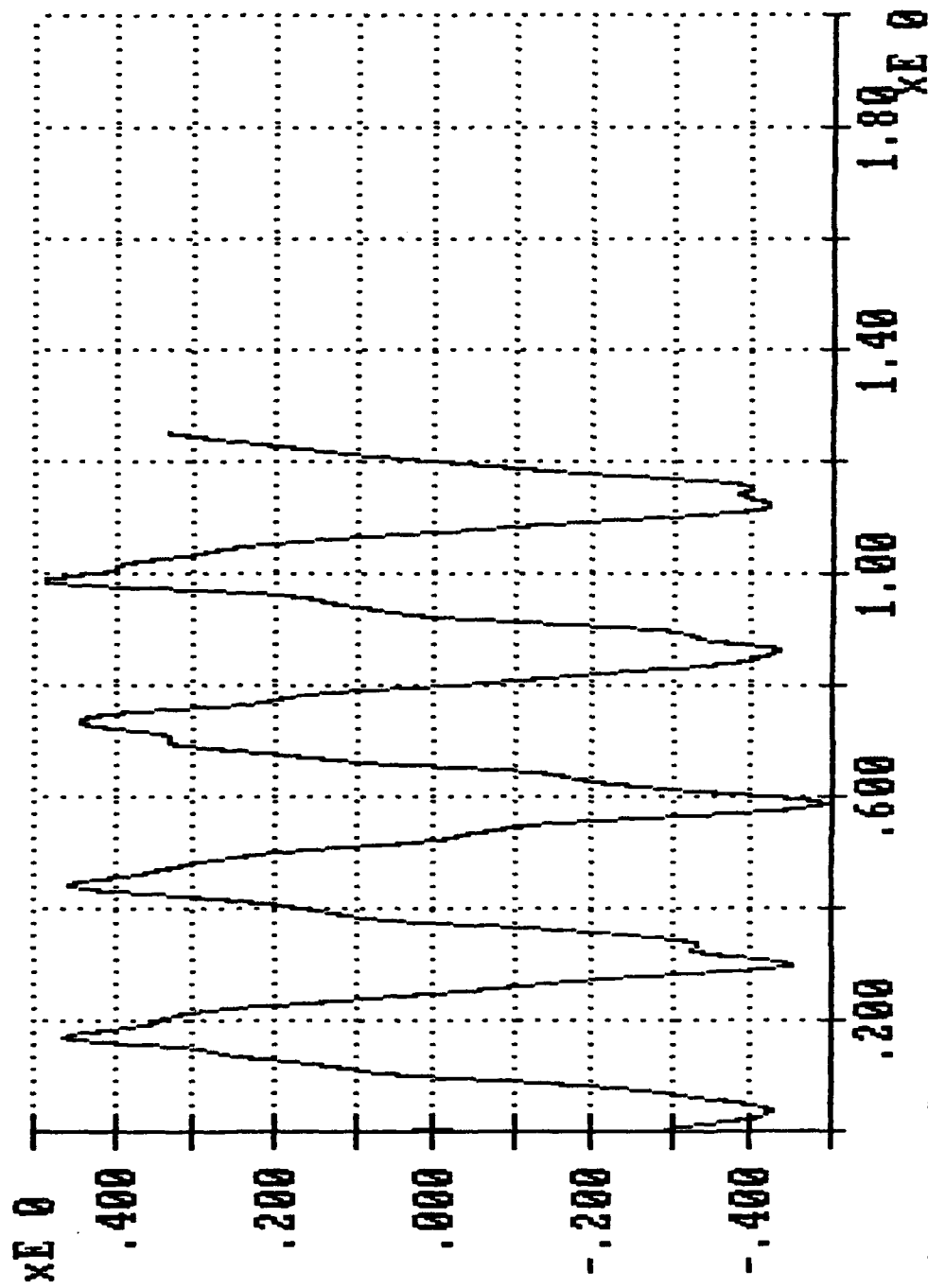
MEASUREMENT -----	MEAN ----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.254	.022
VERT. ACELL. ON SHAKER TABLE	.235	.015
LONG. ACELL. ON LOAD	1.026	.370
LAT. ACELL. ON LOAD	.000	.000
VERT. ACELL. ON LOAD	.345	.064

40mm Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 88 Minutes)

MEASUREMENT -----	MEAN ----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.275	.025
VERT. ACELL. ON SHAKER TABLE	.246	.013
LONG. ACELL. ON LOAD	.933	.186
LAT. ACELL. ON LOAD	.000	.000
VERT. ACELL. ON LOAD	.354	.062

40mm Cans on Standard Metal Pallet in Long. Position (Date: 10-26-87, Time into Test: 0 Minutes)

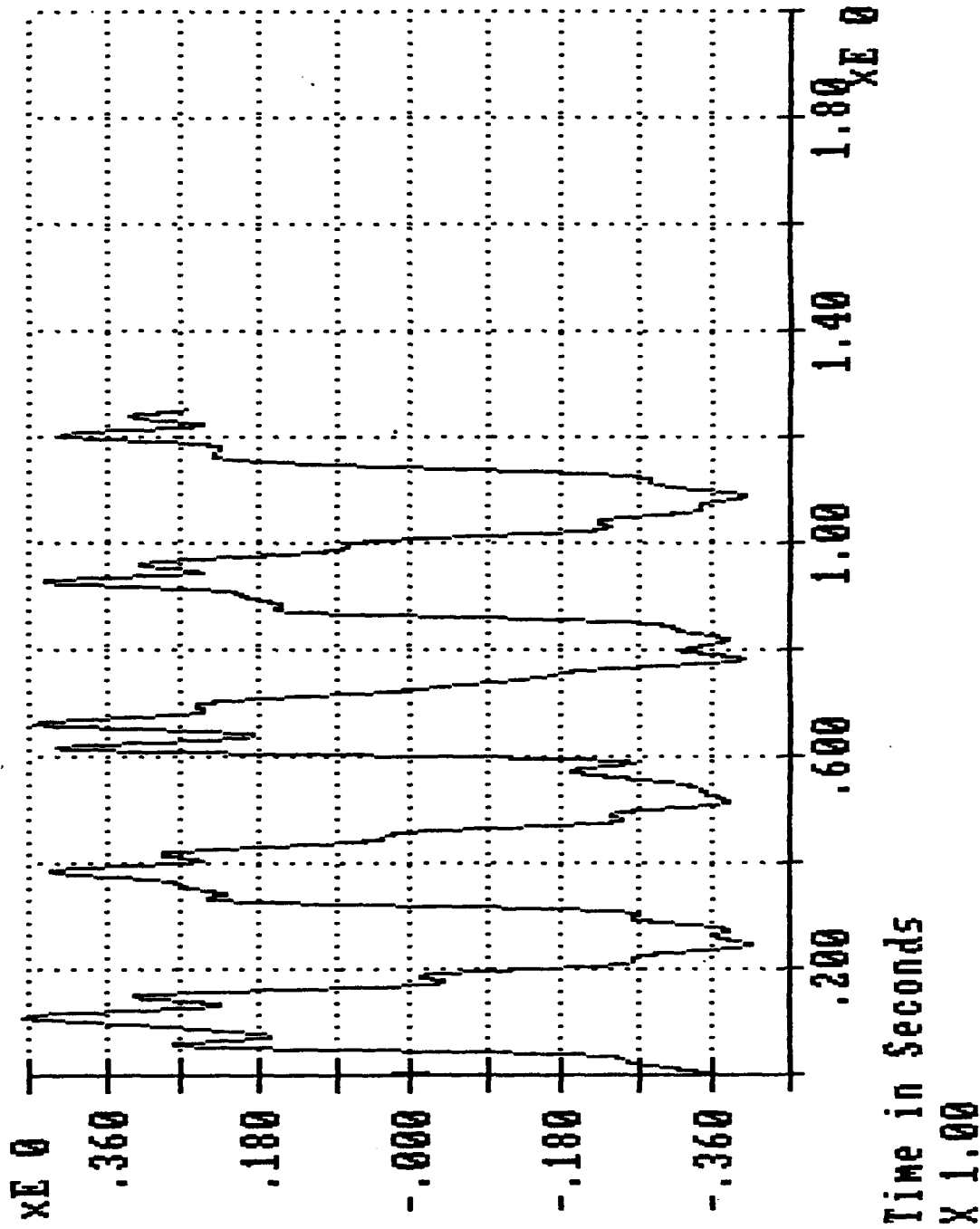
LONG. ABS CELL. ON SHAK. I



Time in Seconds
 X 1.00

40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 0 Minutes)

VERTICAL ACCEL 1.00
 ON SHAK II

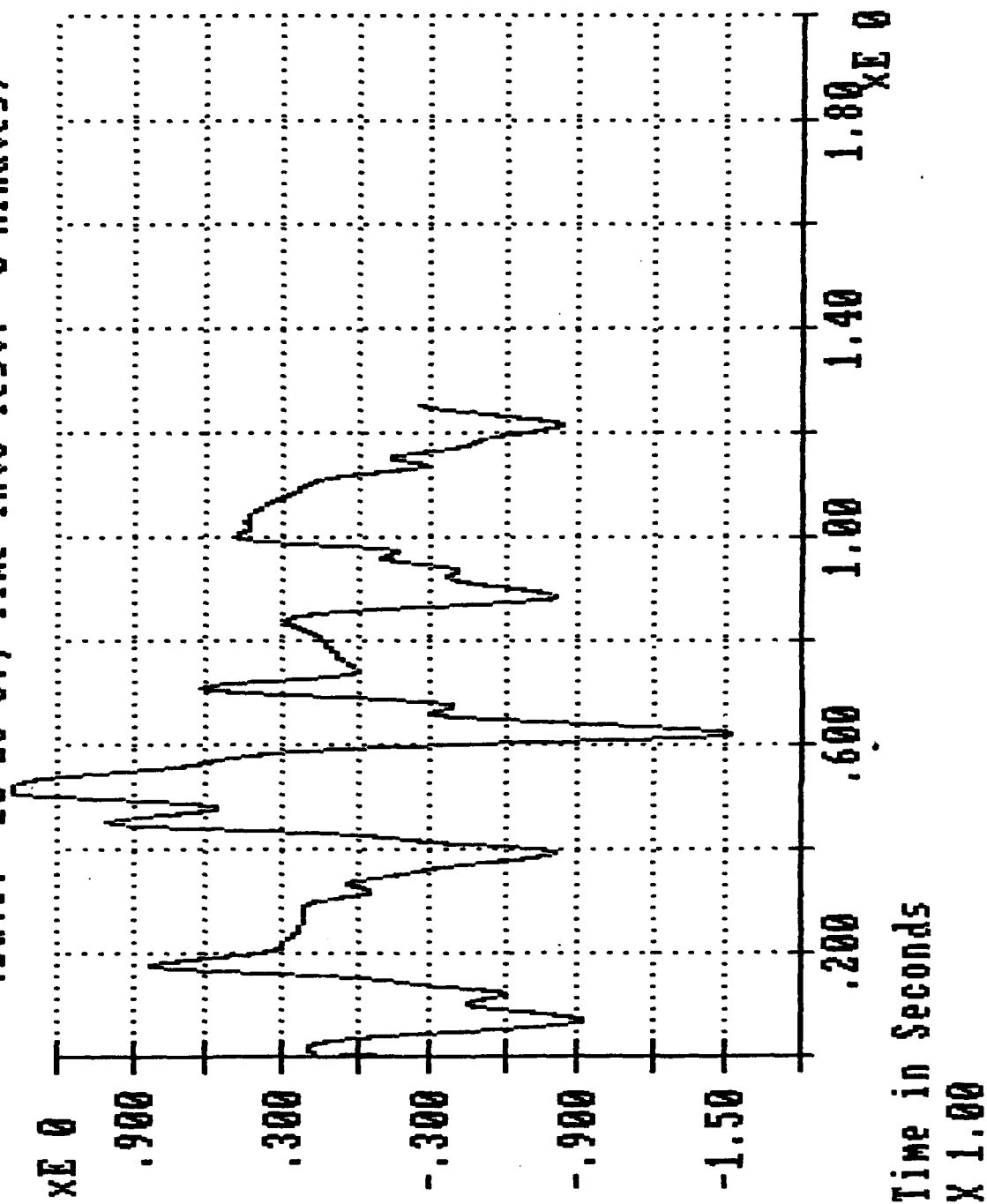


40mm Cans on Standard Metal Pallet in Long. Position

(Date: 10-26-87, Time into Test: 0 Minutes)

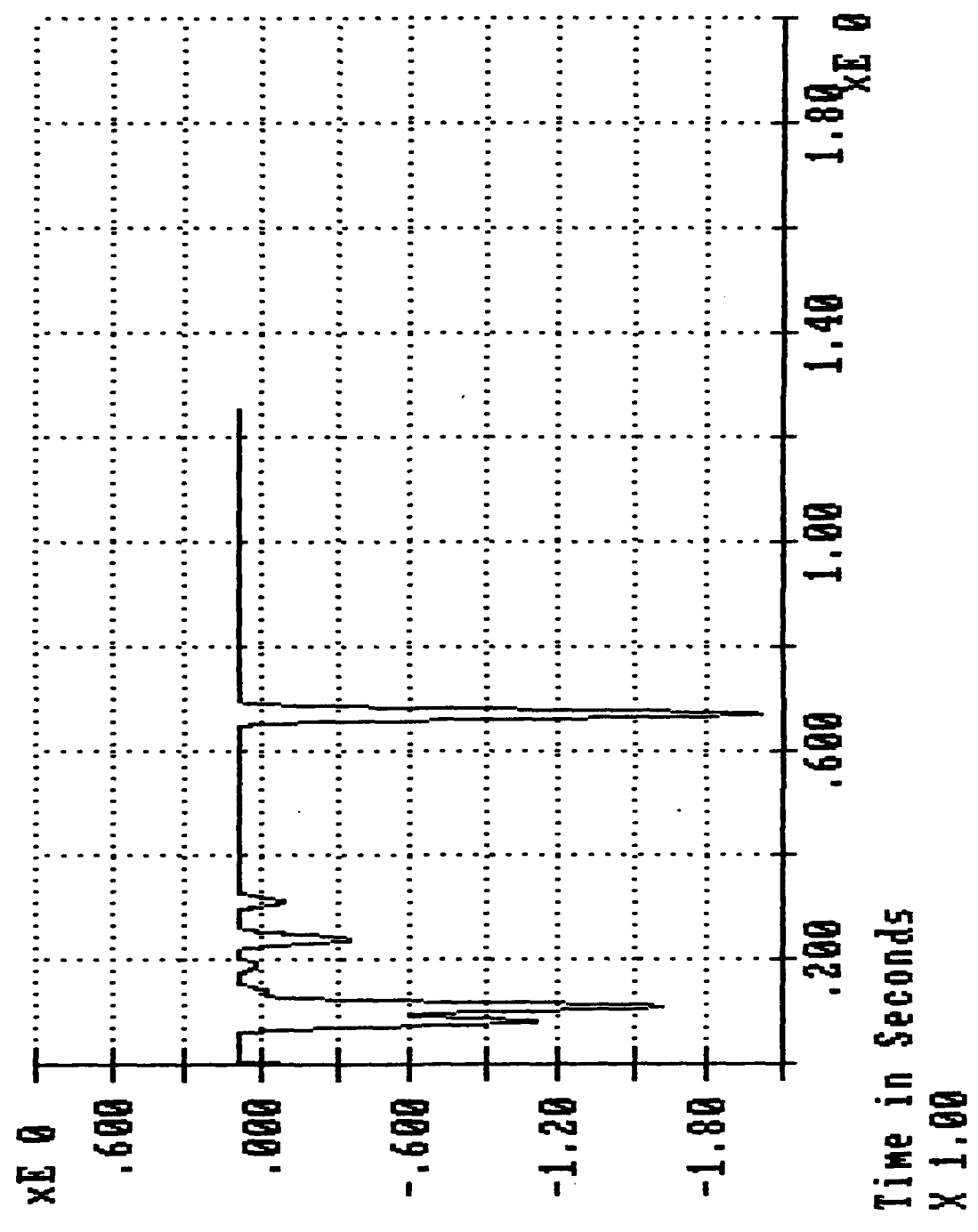
LONG, SIX X 1.00

LONG - ACCELL - ON LOAD



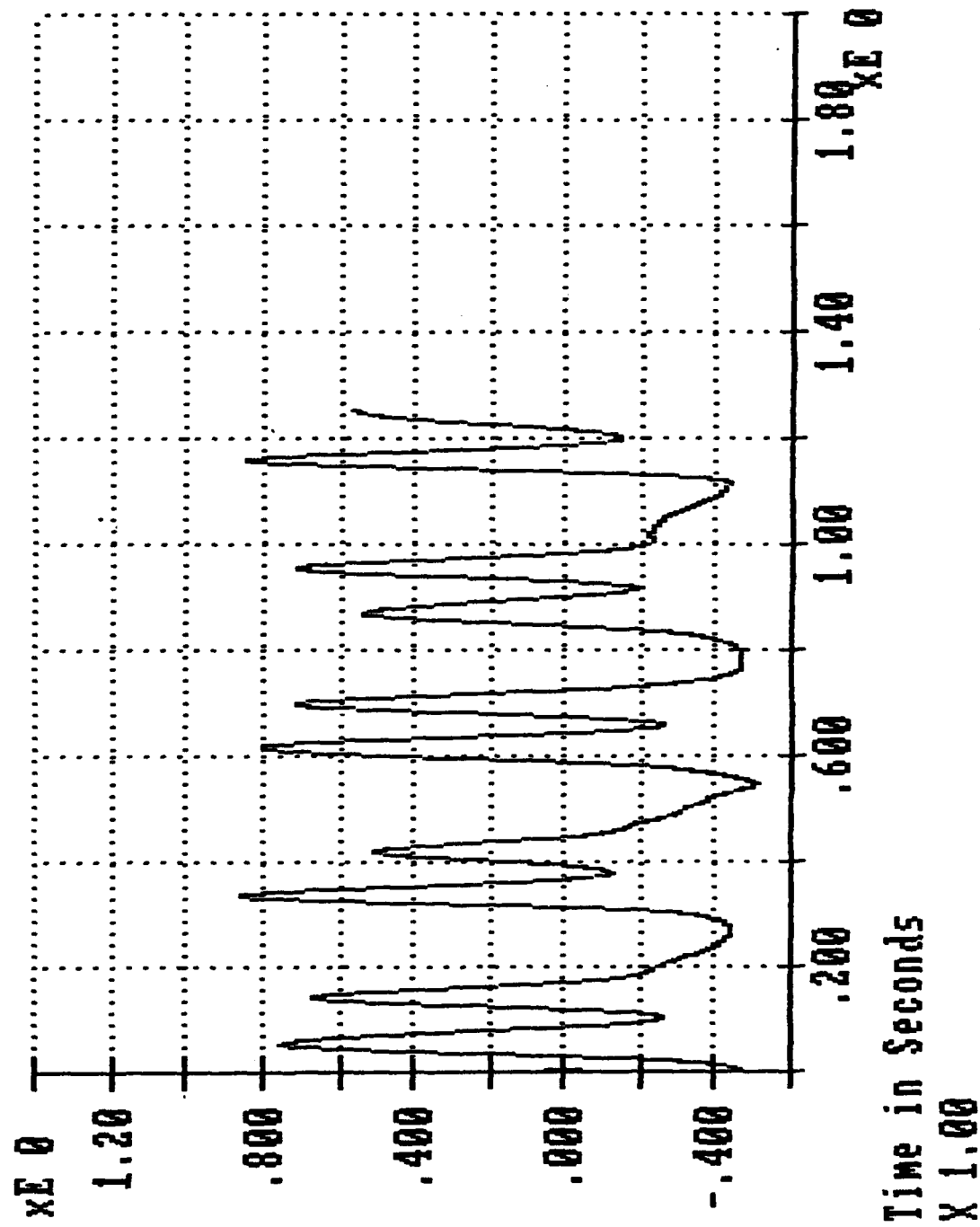
L A T . A C C E L L . O N L O A D
 I N G , S X I . 0 0

40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 0 Minutes)



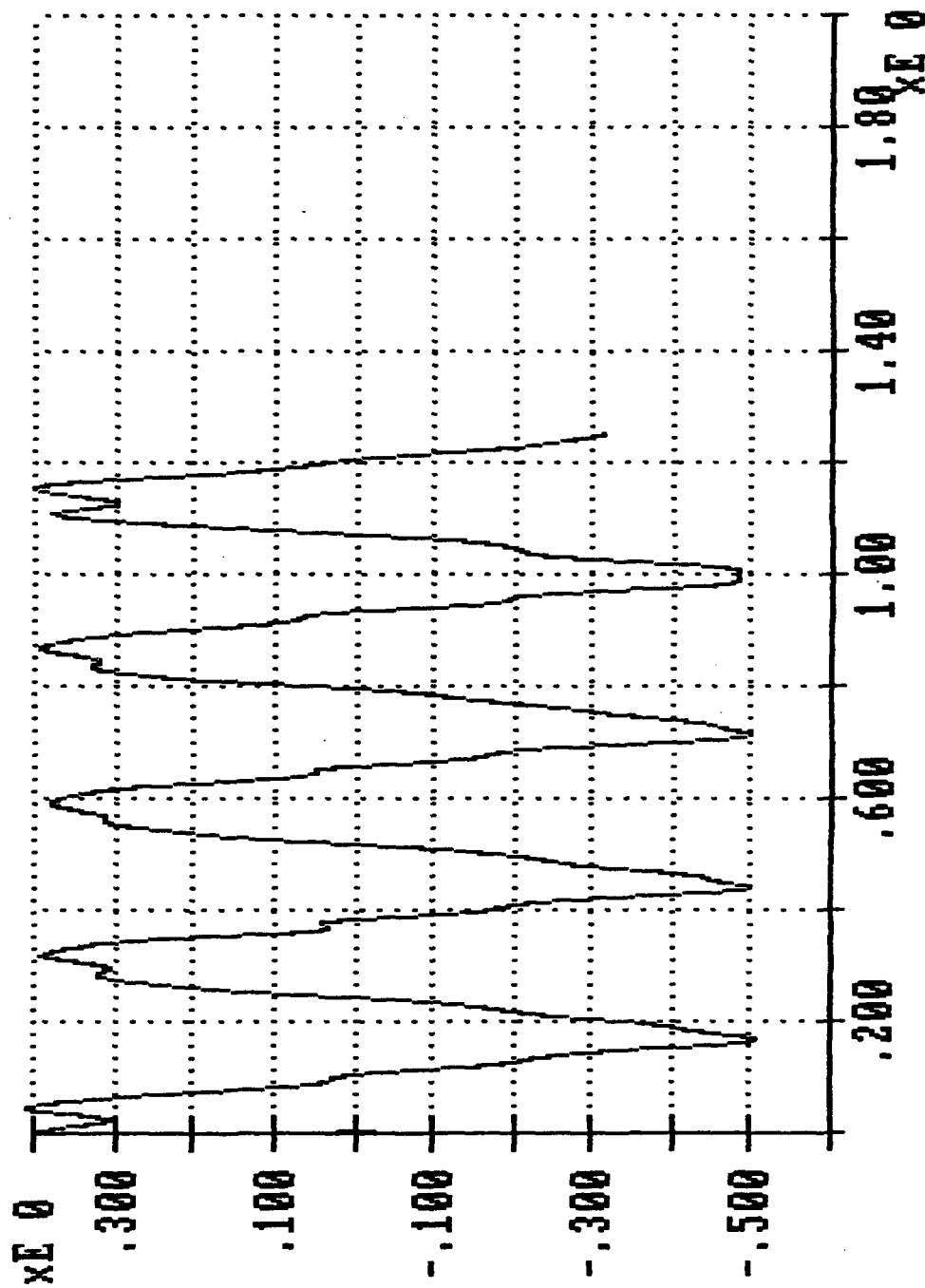
40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 0 Minutes)

VERTICAL ACCELL ON LOAD



40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 22 Minutes)

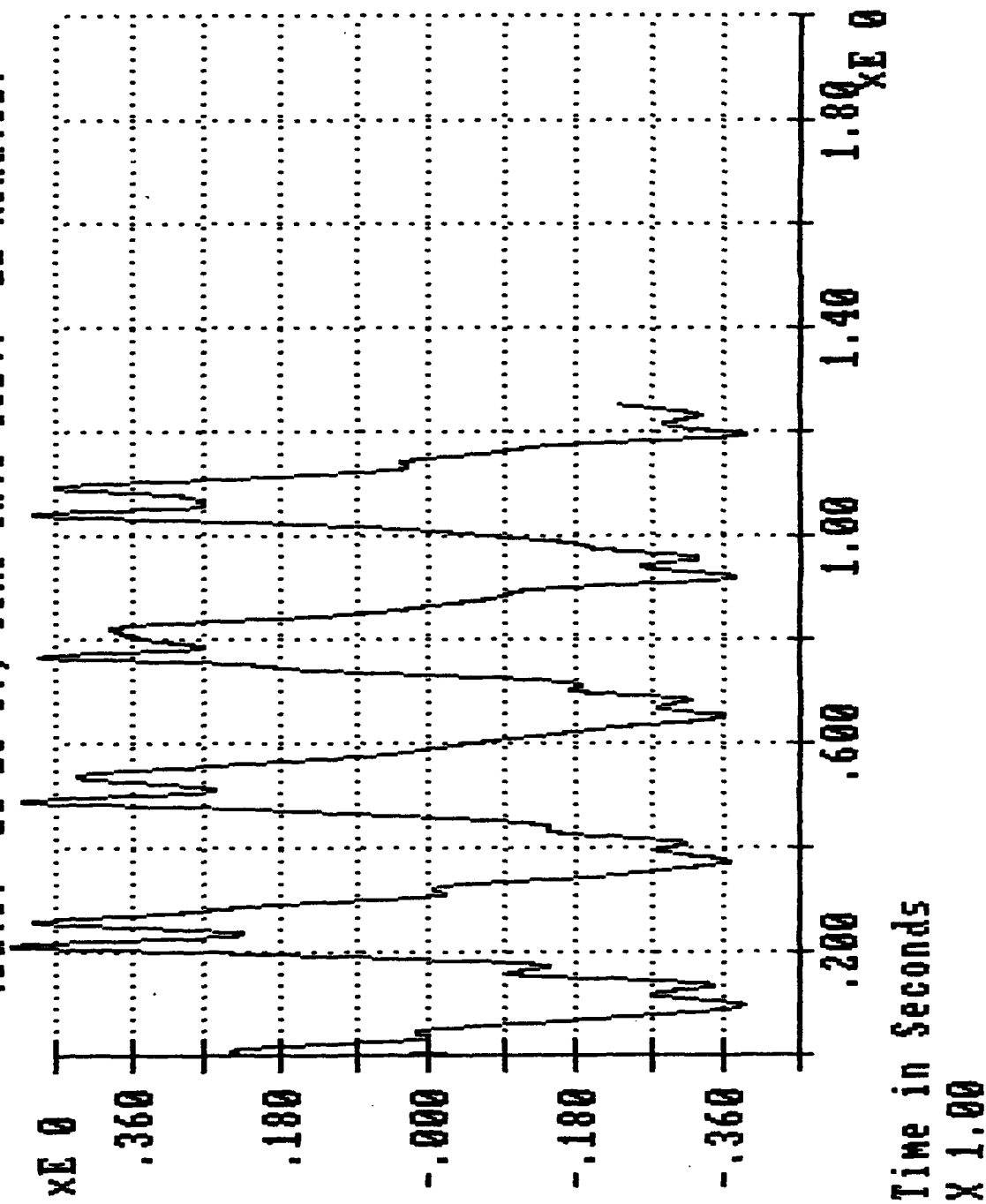
LONG. ACCEL. ON SHAK :
 L E I T G . A B S I . 0 0
 X E 0



Time in Seconds
 X 1.00

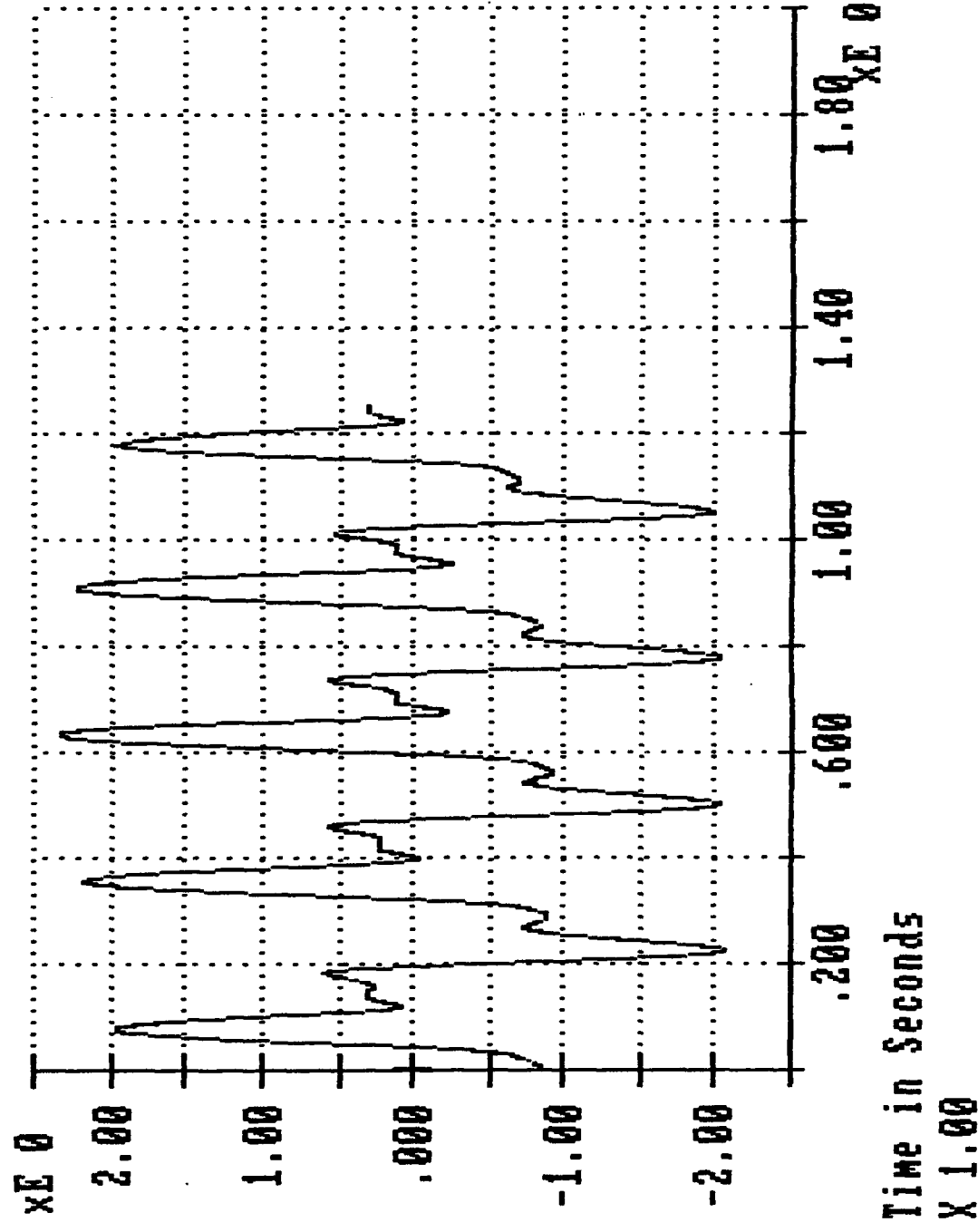
40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 22 Minutes)

VERTICAL ACCEL. ON SHAKING
 URGENT
 1.00



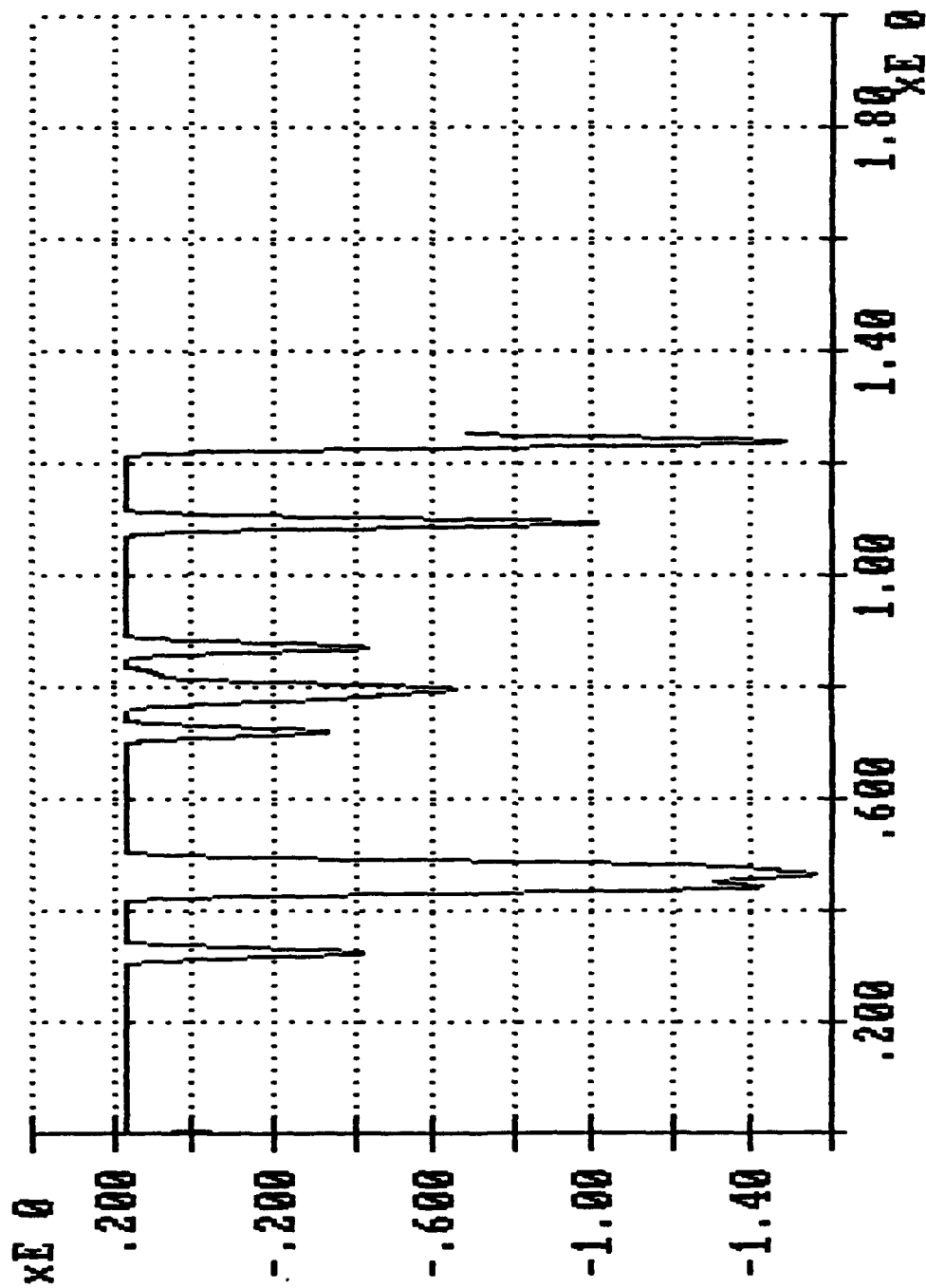
LONG . ACCEL . ON LOAD
IN G S X 1.00

40MM Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 22 Minutes)



40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 22 Minutes)

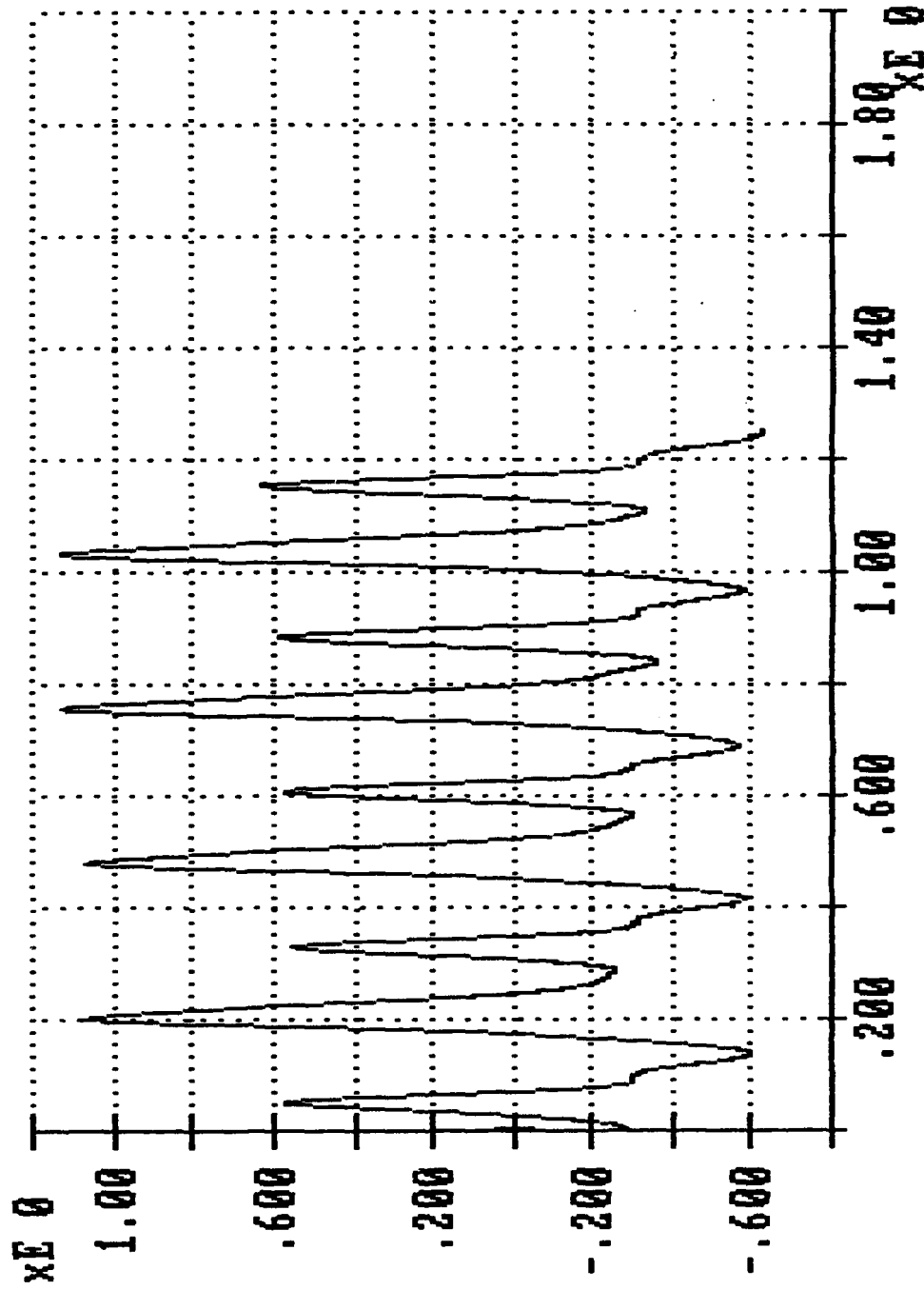
L A T . A C E L L . O N L O A D
 I N G , S X 1 . 0 0



Time in Seconds
 X 1.00

VERT . ACCELL . ON LOAD

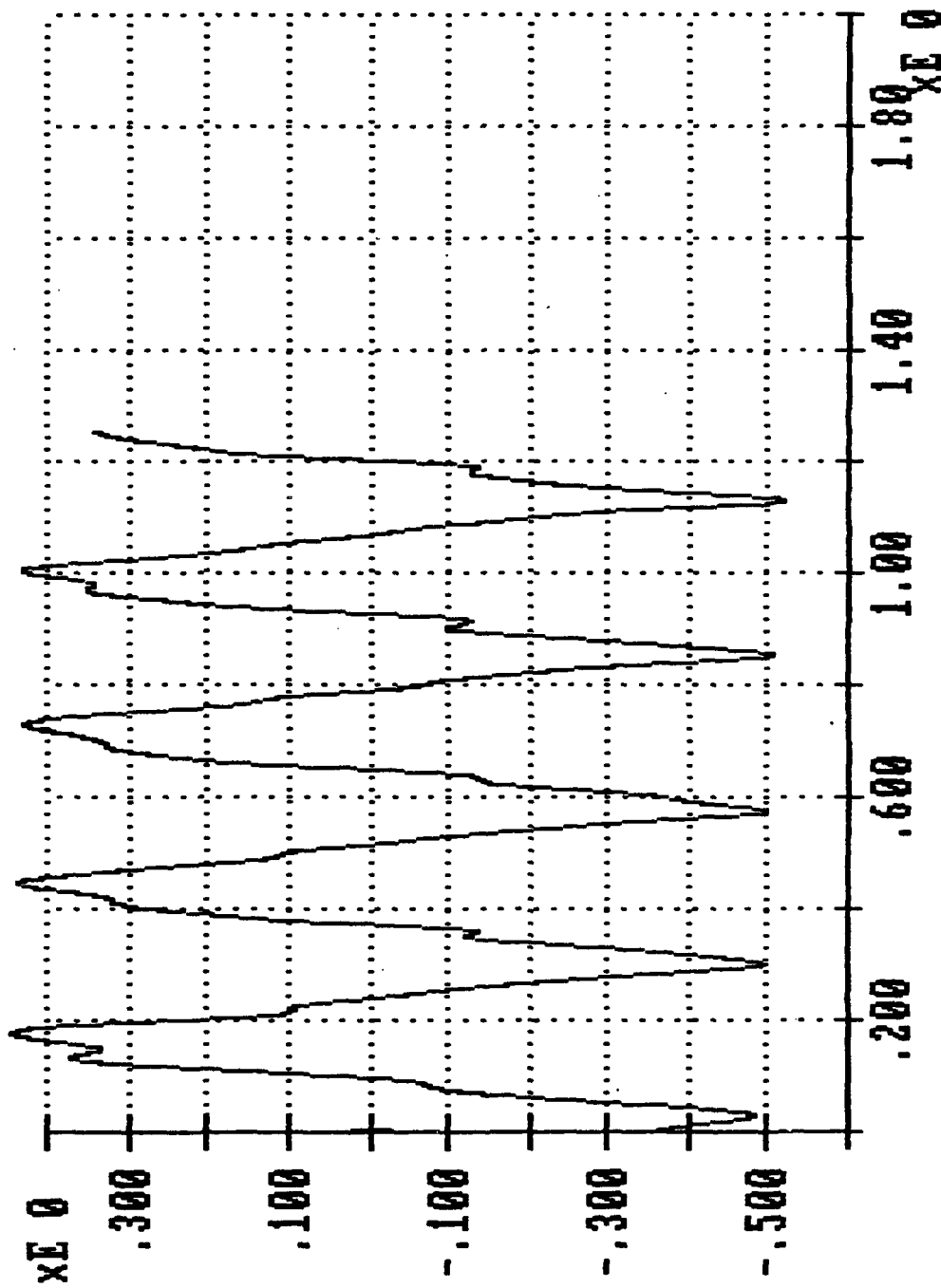
40MM Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 22 Minutes)



Time in Seconds
X 1.00

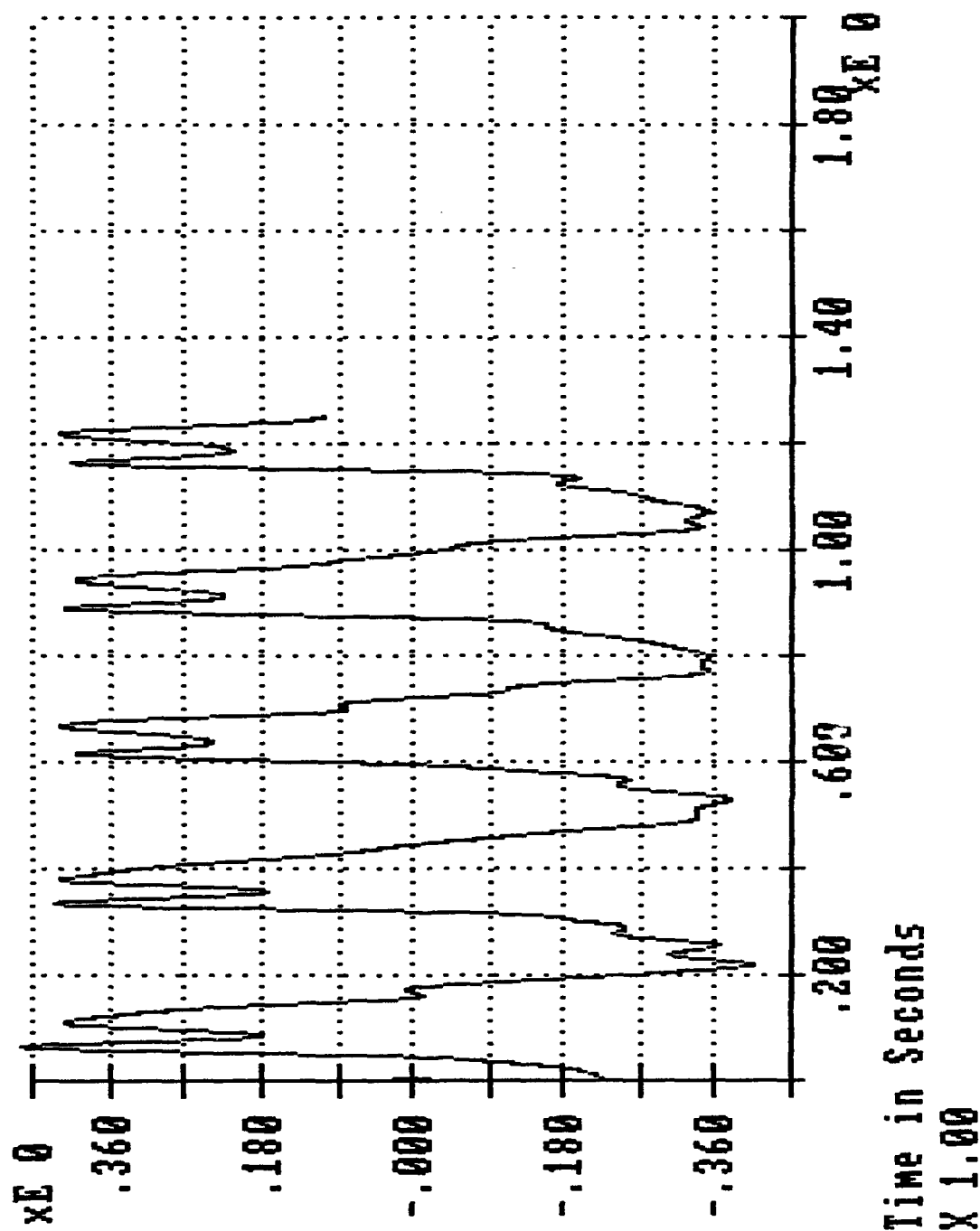
40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 44 Minutes)

LONG . ACCEL . ON SHAK :
 L E I
 N G
 T G
 A S
 B L X
 1 : 0 0



Time in Seconds
 X 1.00

40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 44 Minutes)

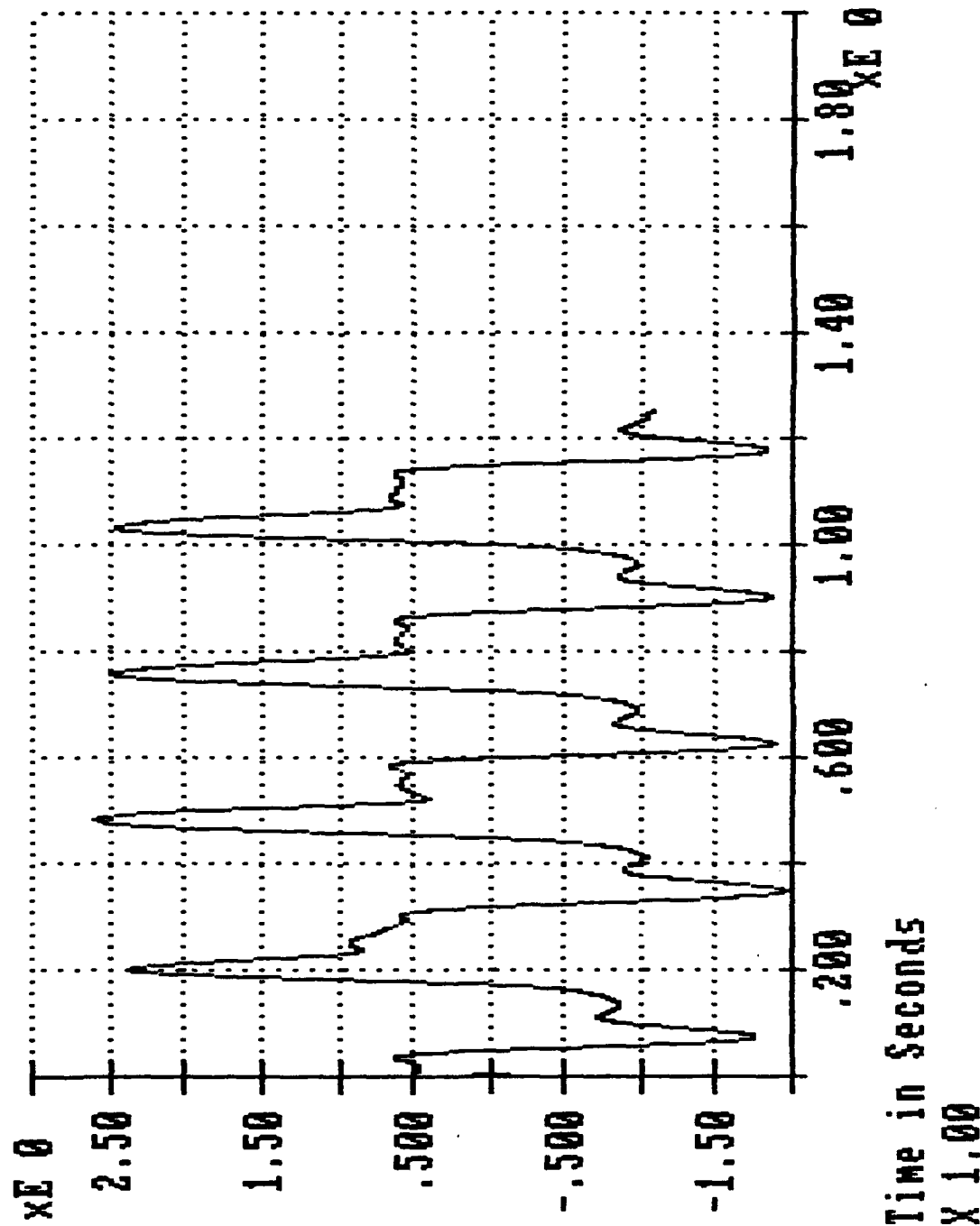


VERTICAL ACCEL. ON SHAK. I
 I
 T G, ABS 1.00

40mm Cans on Standard Metal Pallet in Long. Position (Date: 10-26-87, Time into Test: 44 Minutes)

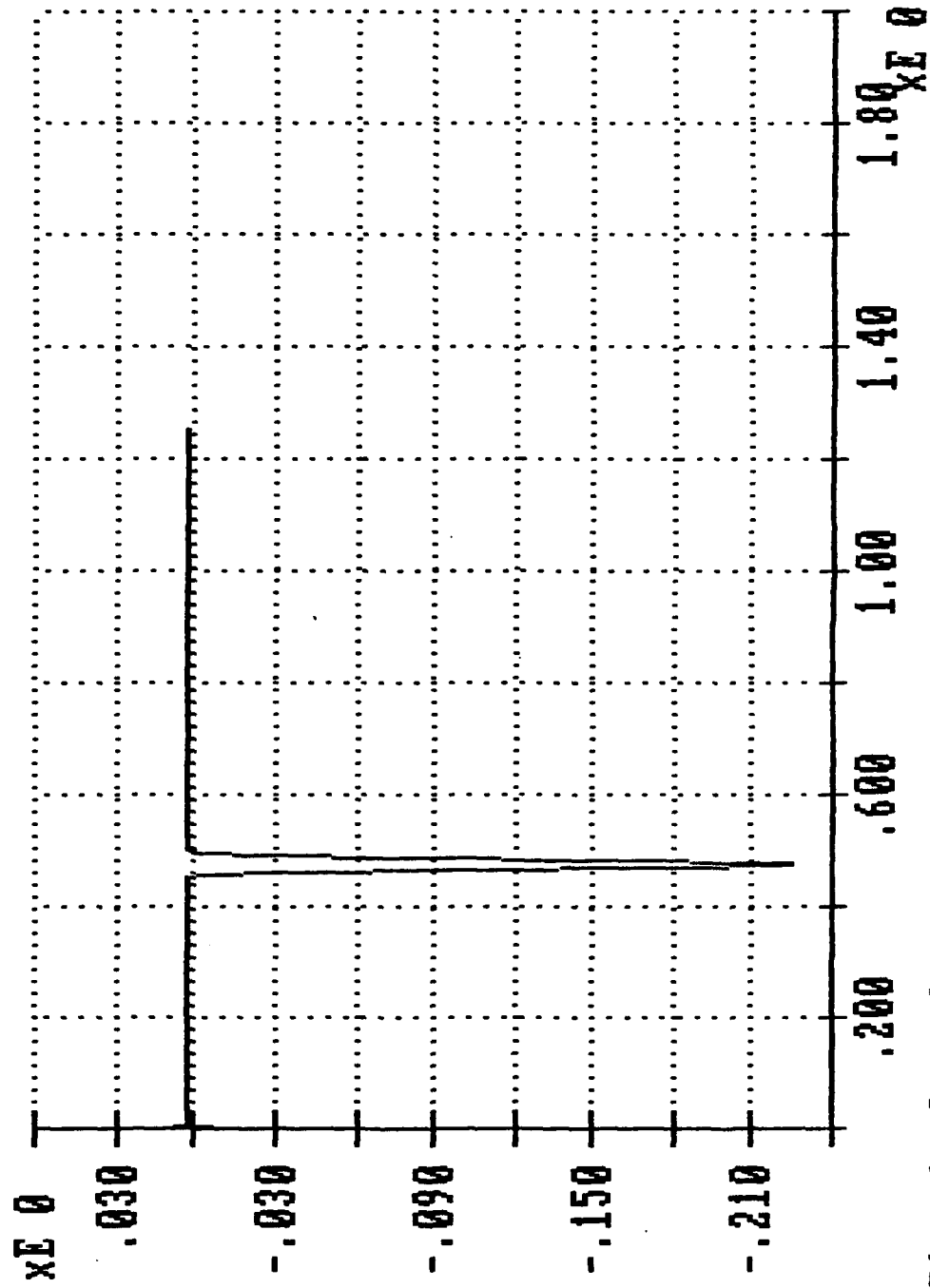
I N G , S X I . 0 0

L O N G . A C E L L . O N L O A D



40MM Cans on Standard Metal Pallet in Long. Position (Date: 10-26-87, Time into Test: 44 Minutes)

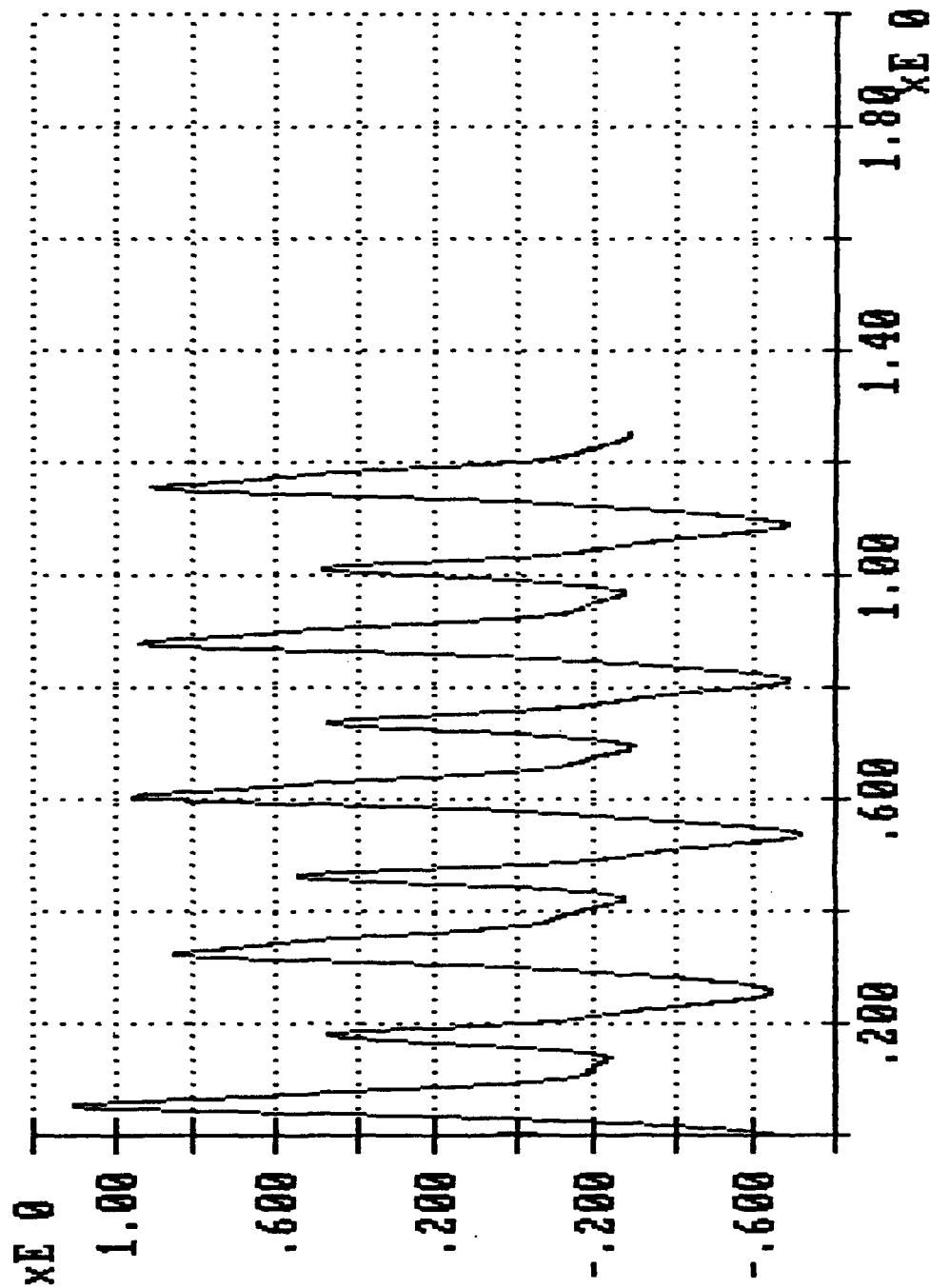
L A T . A C E L L . O N L O A D
I N G , S X I . 0 0



Time in Seconds
X 1.00

40mm Cans on Standard Metal Pallet in Long. Position (Date: 10-26-87, Time into Test: 44 Minutes)

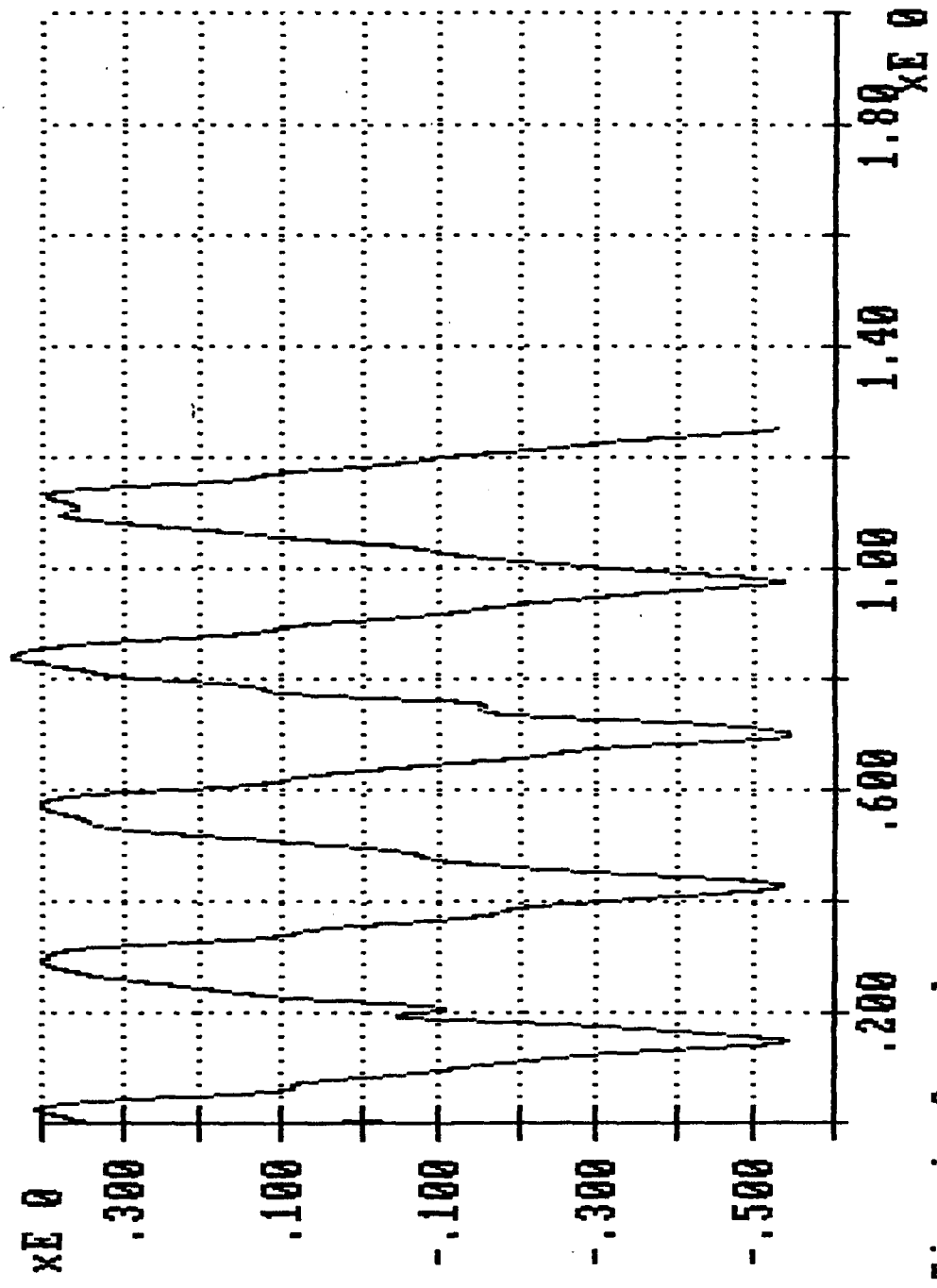
VERT. ACCEL. ON LOAD



Time in Seconds
X 1.00

40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 66 Minutes)

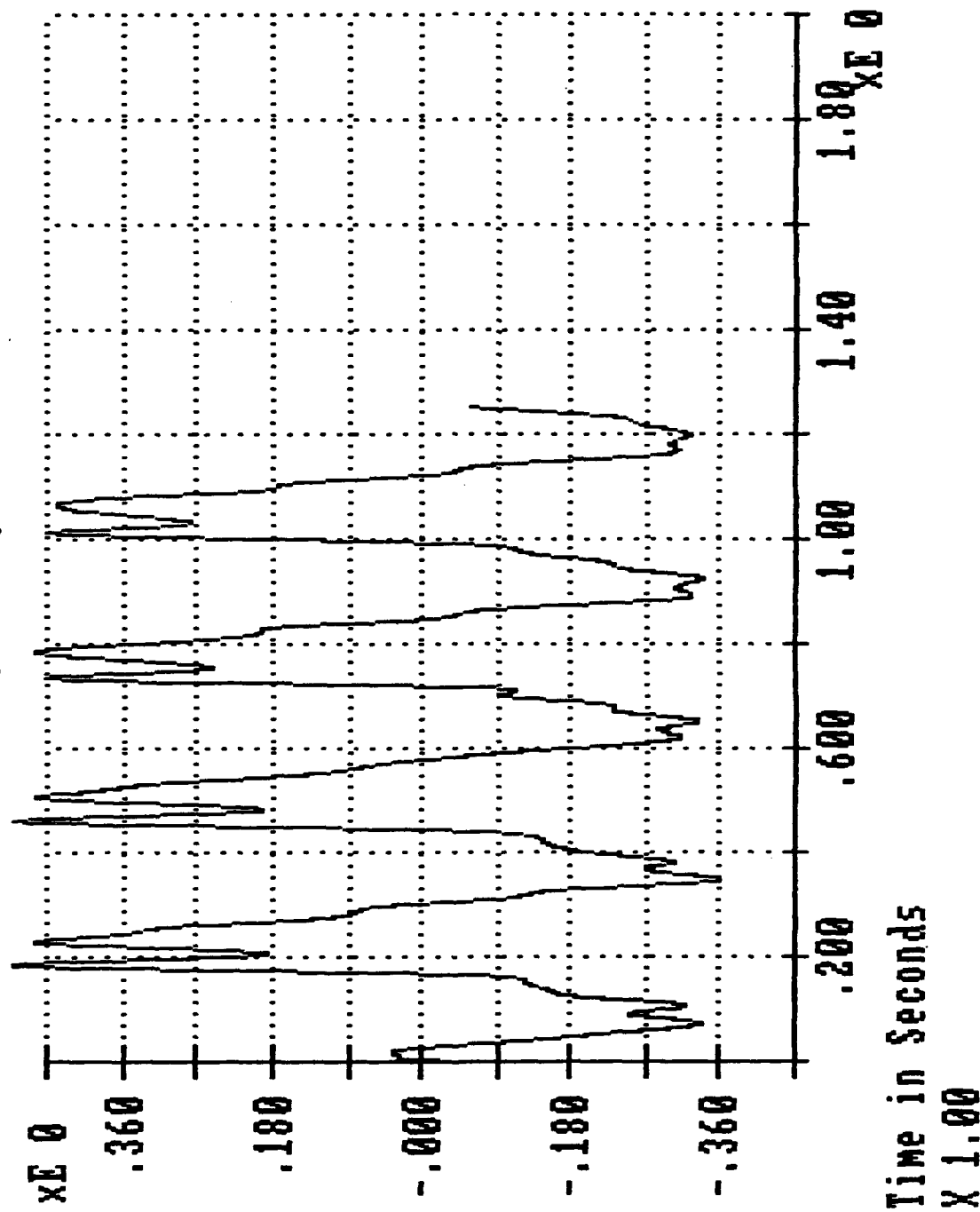
LONG . ACCEL . ON SHAK I
 L E I
 N G
 T G
 A S
 B L X
 1 . 0 0



Time in Seconds
 X 1.00

40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 66 Minutes)

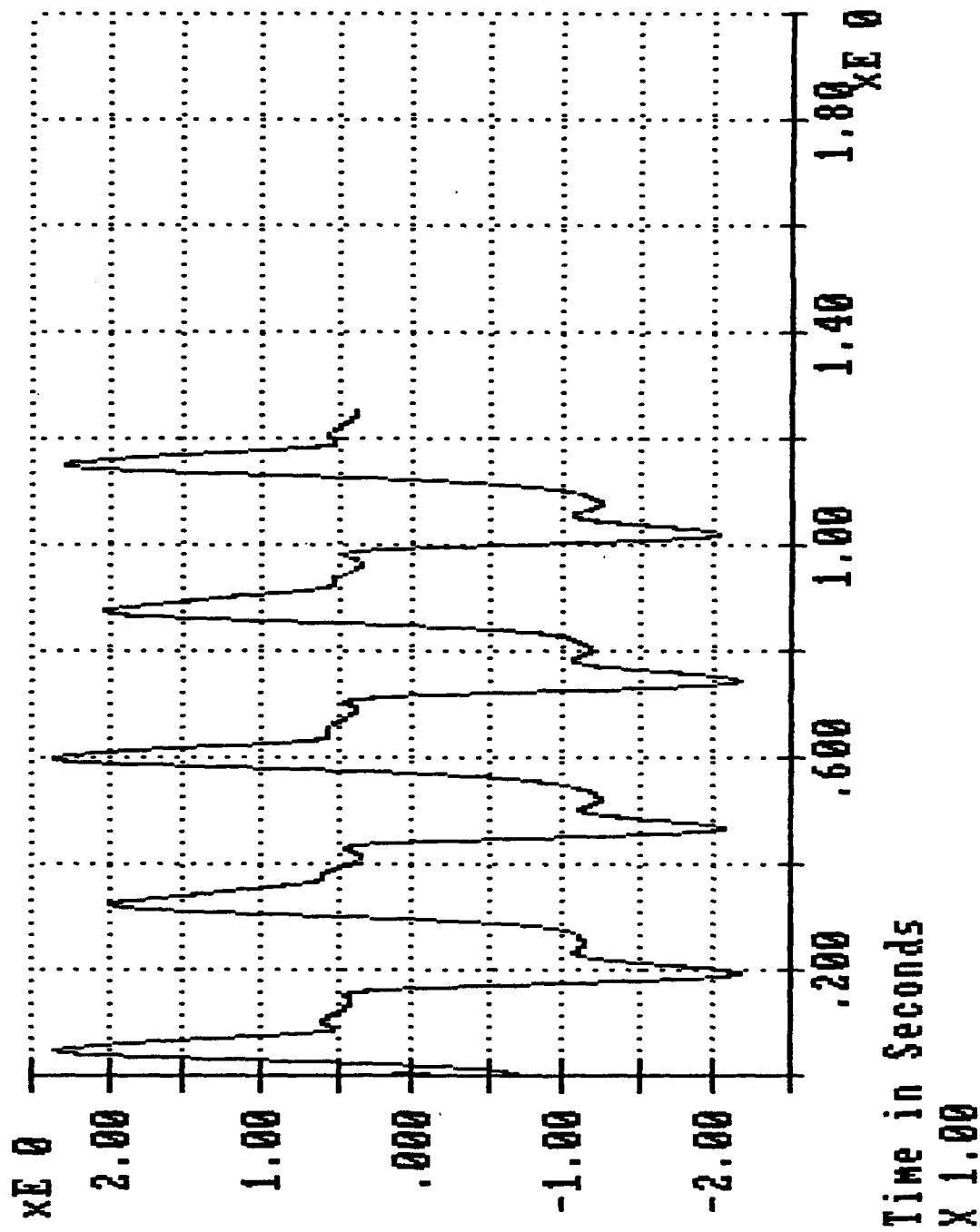
VERTICAL ACCEL 1.00 ON SHAK II



40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 66 Minutes)

I N G , S X 1 . 0 0

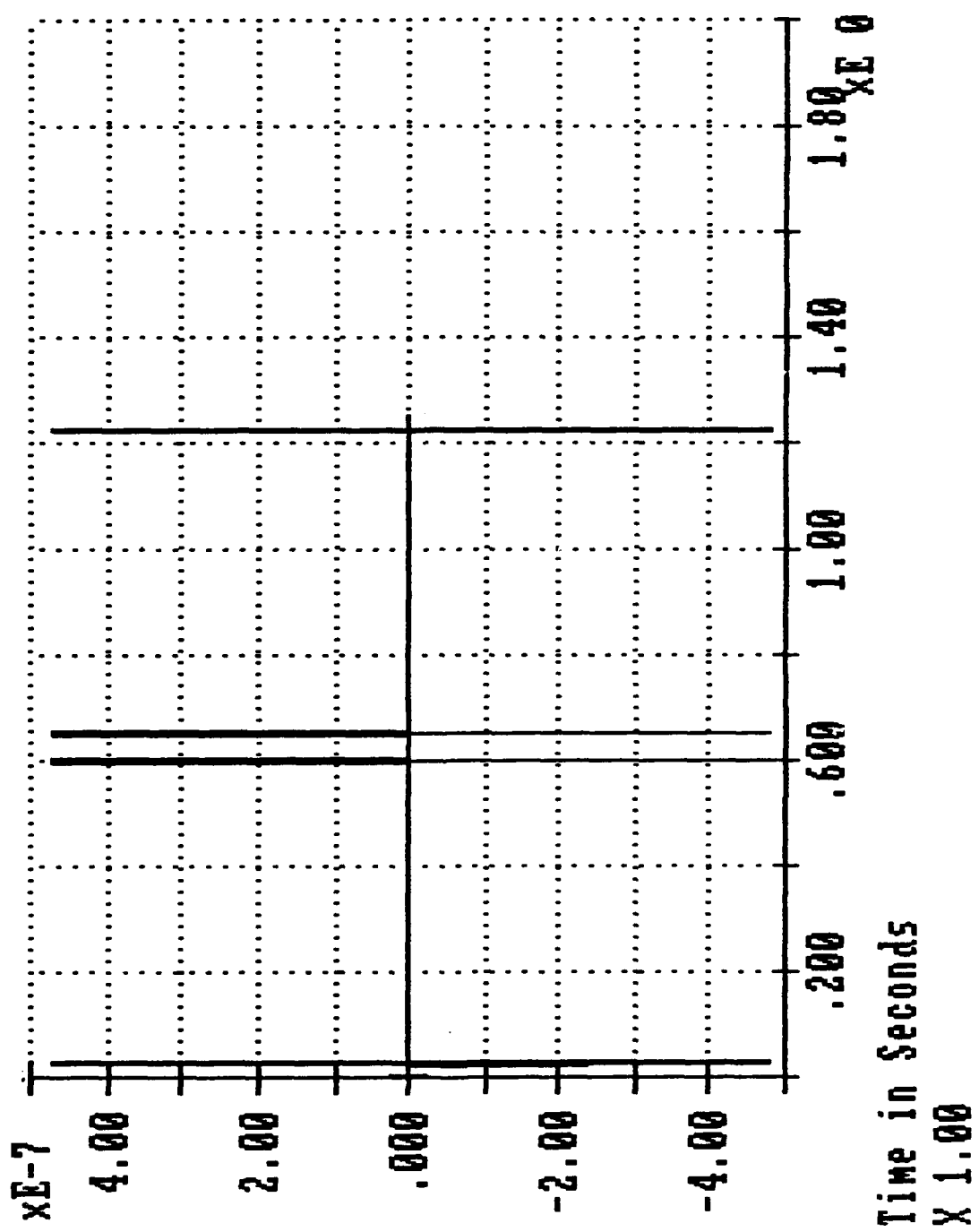
L O N G . A C C E L L . O N L O A D



40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 66 Minutes)

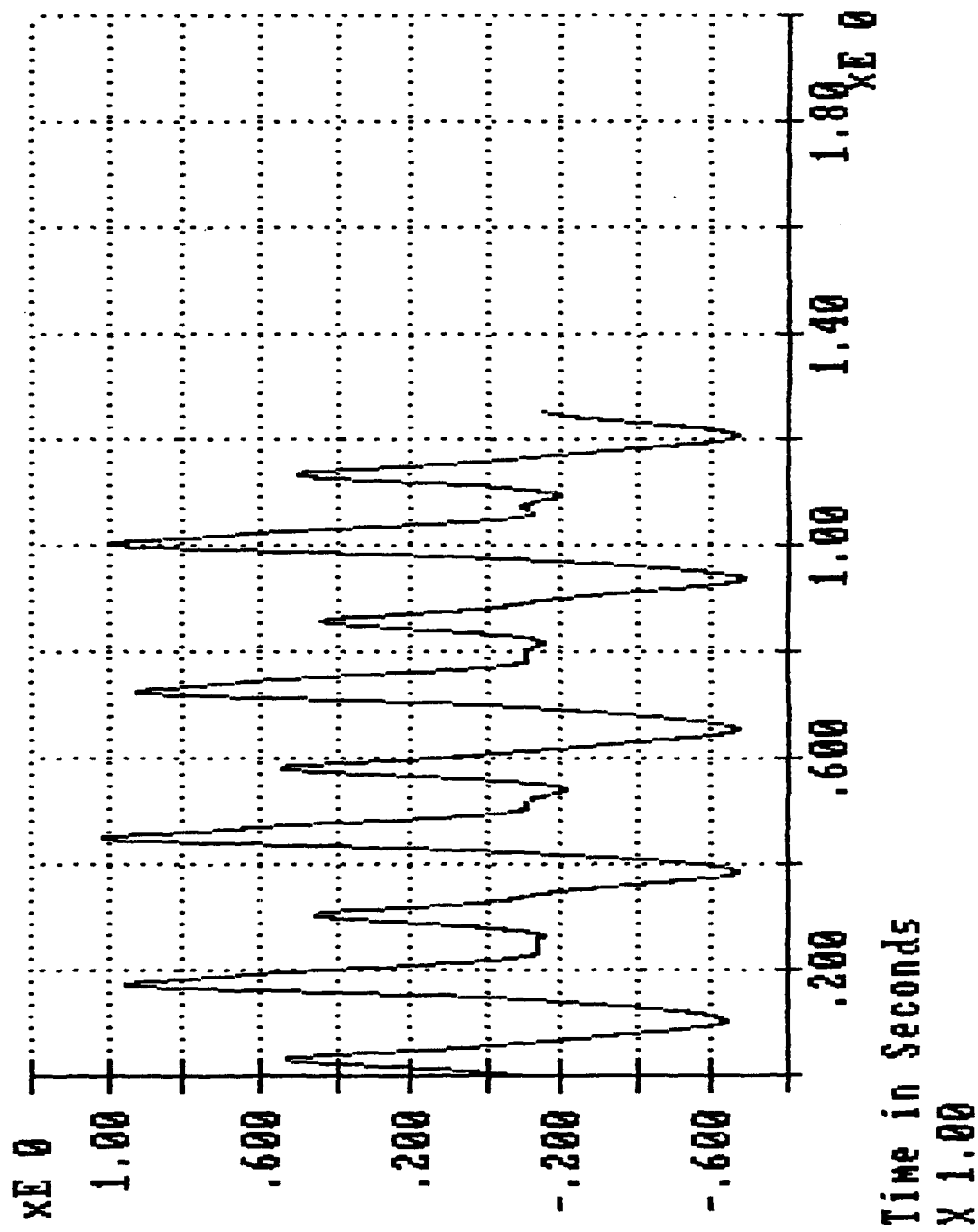
IN G, S X . 0 0

L A T . A C E L L . O N L O A D



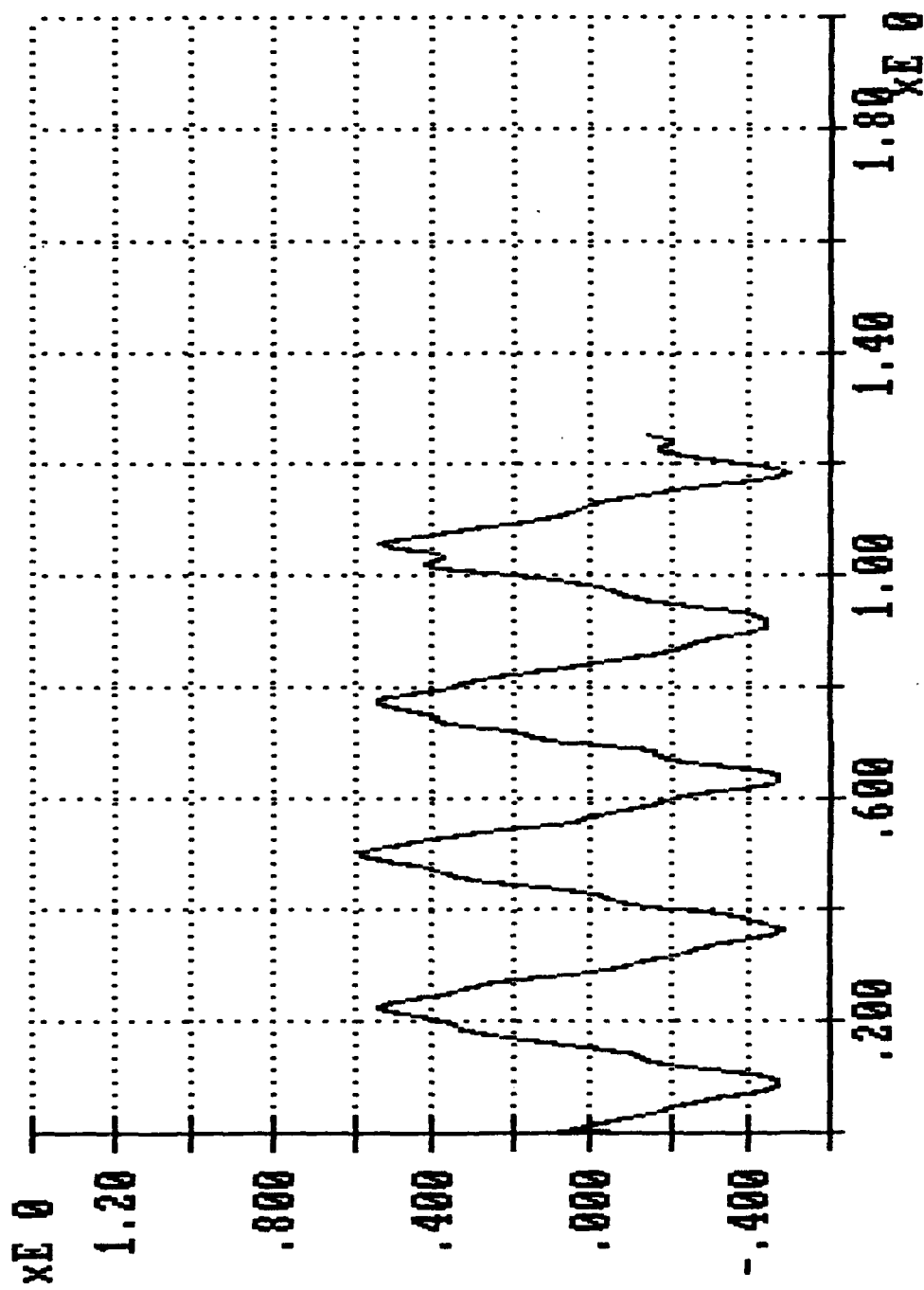
VERTICAL ACCELL ON LOAD

40MM Cans on Standard Metal Pallet in Long. Position
(Date: 10-26-87, Time into Test: 66 Minutes)



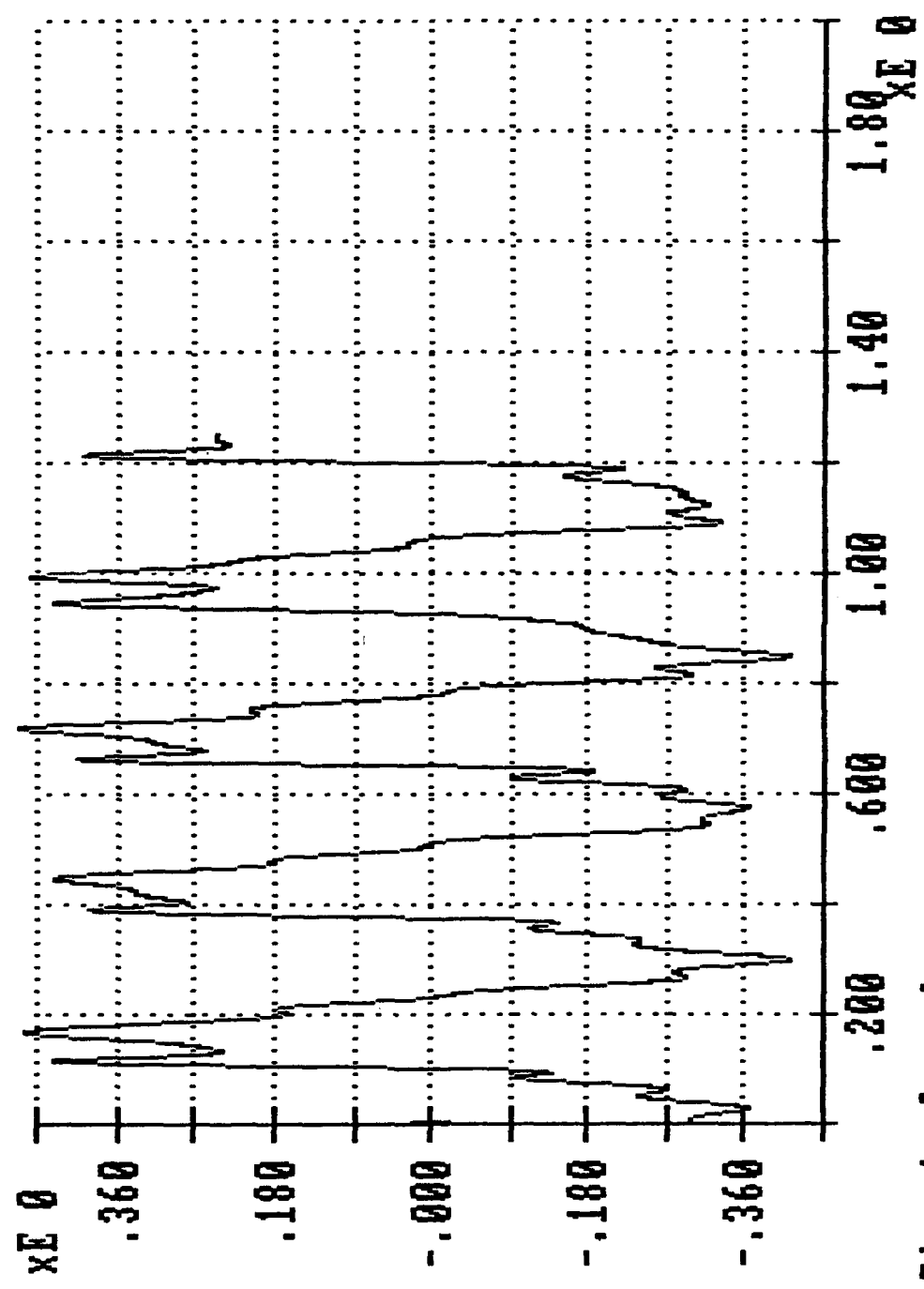
40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 88 Minutes)

LONG . ACCEL 1.00
 ON SHAK :



40mm Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 88 Minutes)

VERTICAL ACCELERATION DOWN SHAKING



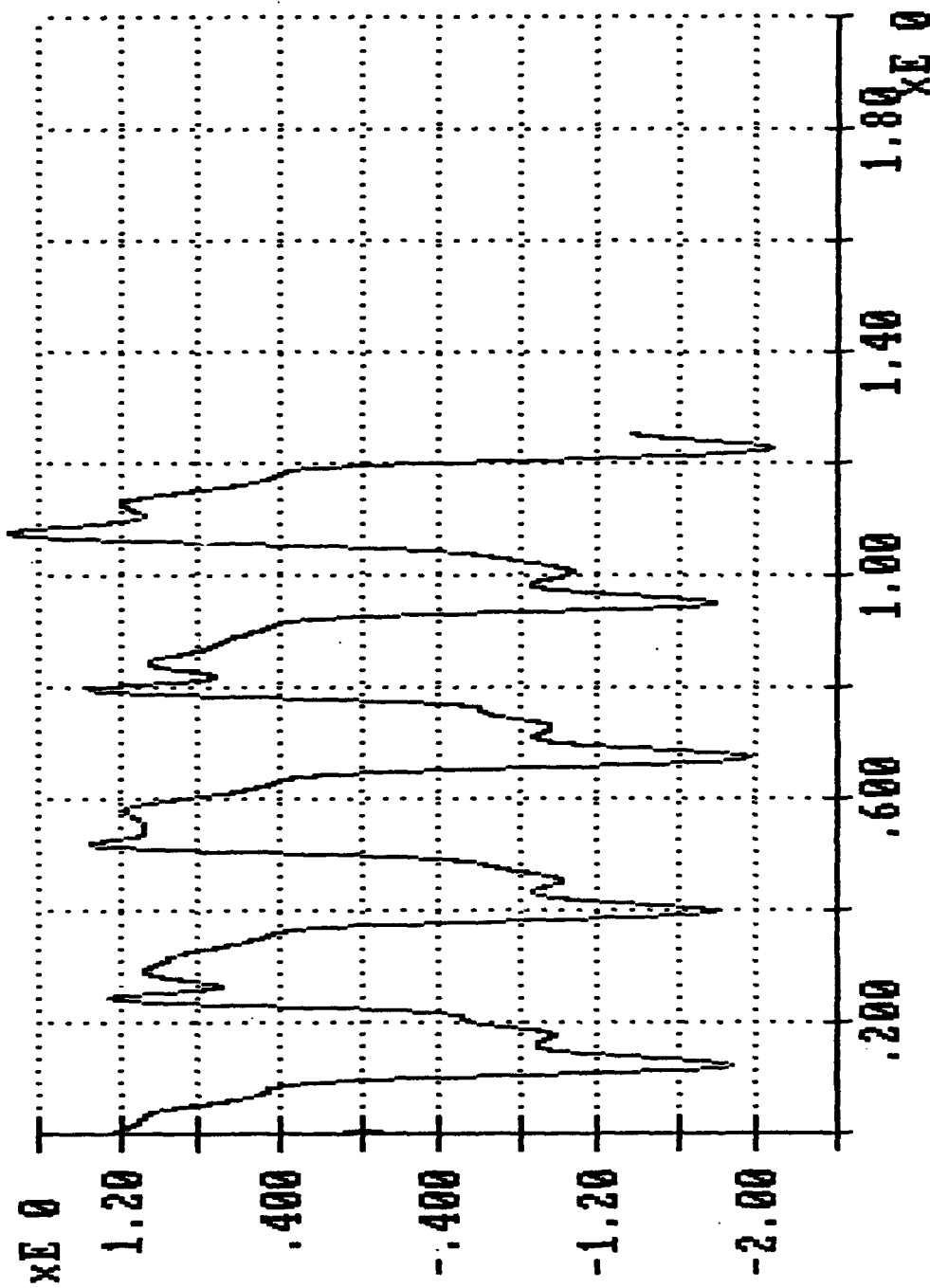
Time in Seconds
 X 1.00

40mm Cans on Standard Metal Pallet in Long. Position

(Date: 10-26-87, Time into Test: 88 Minutes)

LONG, SIX

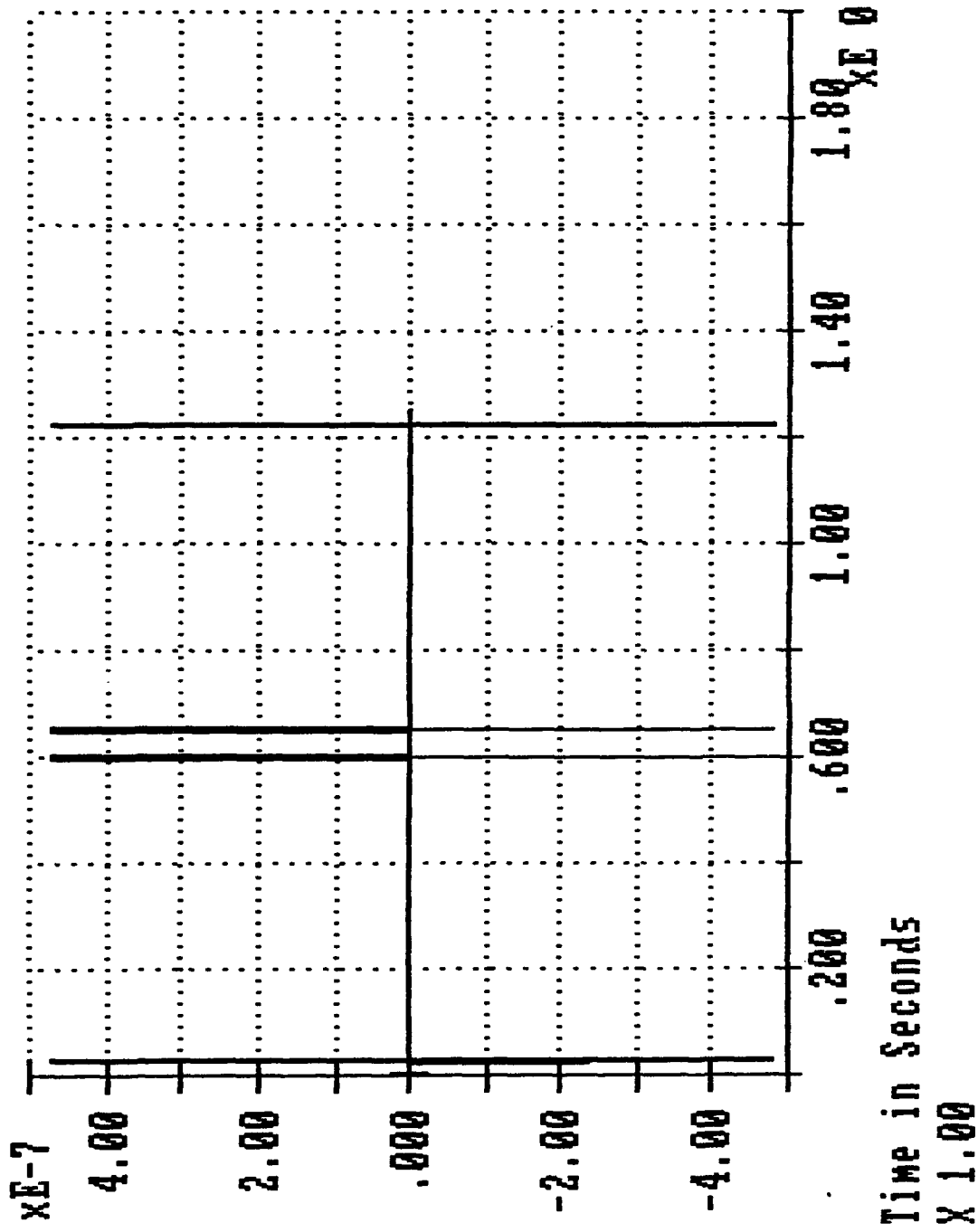
CELL ON LOAD



Time in Seconds
X 1.00

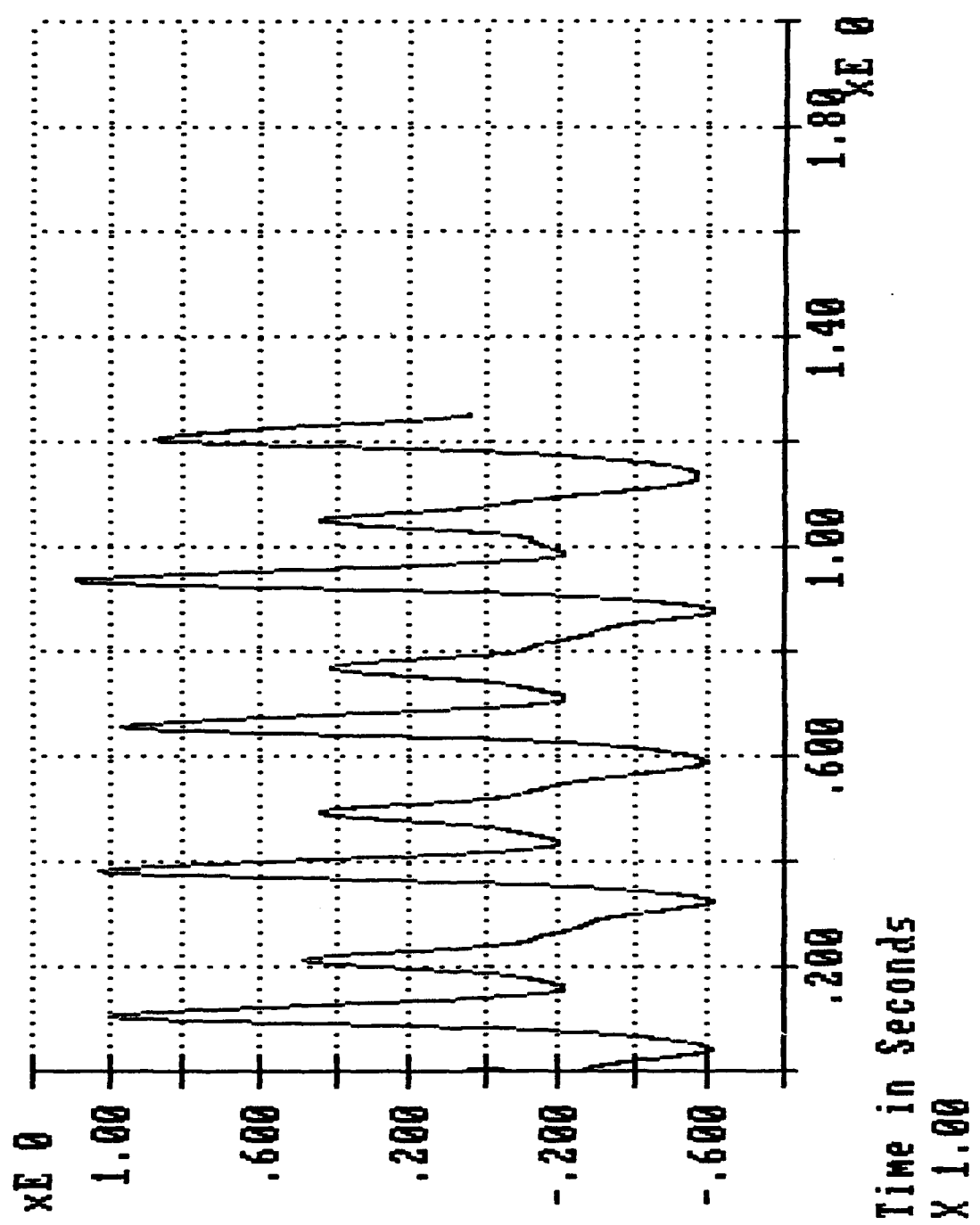
LAT . ACELL . ON . LOD
 I N G , S X : 0 0

40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 88 Minutes)



40MM Cans on Standard Metal Pallet in Long. Position
 (Date: 10-26-87, Time into Test: 88 Minutes)

VERT . ACCELL . ON LOAD



40mm Cans on Standard Metal Pallet in Lateral Position
(Date: 10-27-87, Time into Test: 0 Minutes)

MEASUREMENT -----	MEAN -----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.304	.038
VERT. ACELL. ON SHAKER TABLE	.220	.012
LONG. ACELL. ON LOAD	.362	.099
LAT. ACELL. ON LOAD	.138	.065
VERT. ACELL. ON LOAD	.284	.026

40mm Cans on Standard Metal Pallet in Lateral Position
(Date: 10-27-87, Time into Test: 22 Minutes)

MEASUREMENT -----	MEAN -----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.408	.098
VERT. ACELL. ON SHAKER TABLE	.224	.010
LONG. ACELL. ON LOAD	.567	.151
LAT. ACELL. ON LOAD	.000	.000
VERT. ACELL. ON LOAD	.293	.026

40mm Cans on Standard Metal Pallet in Lateral Position
(Date: 10-27-87, Time into Test: 44 Minutes)

MEASUREMENT -----	MEAN ----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.466	.078
VERT. ACELL. ON SHAKER TABLE	.229	.010
LONG. ACELL. ON LOAD	.601	.241
LAT. ACELL. ON LOAD	.009	.001
VERT. ACELL. ON LOAD	.310	.041

40mm Cans on Standard Metal Pallet in Lateral Position
(Date: 10-27-87, Time into Test: 66 Minutes)

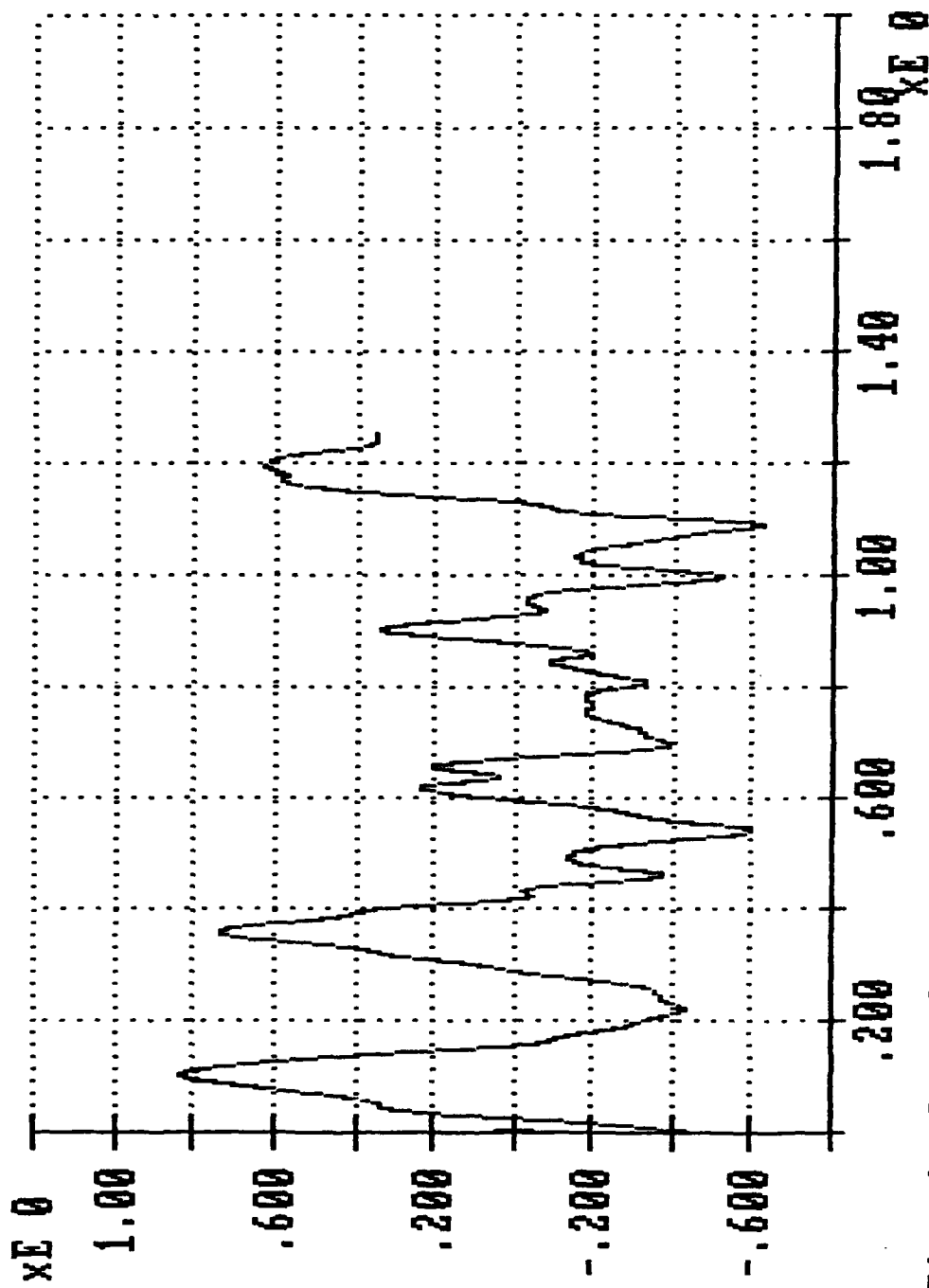
MEASUREMENT -----	MEAN ----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.585	.144
VERT. ACELL. ON SHAKER TABLE	.222	.011
LONG. ACELL. ON LOAD	.819	.219
LAT. ACELL. ON LOAD	.000	.000
VERT. ACELL. ON LOAD	.273	.038

40mm Cans on Standard Metal Pallet in Lateral Position
 (Date: 10-27-87, Time into Test: 88 Minutes)

MEASUREMENT -----	MEAN ----	VARIANCE -----
LONG. ACELL. ON SHAKER TABLE	.475	.061
VERT. ACELL. ON SHAKER TABLE	.237	.009
LONG. ACELL. ON LOAD	.633	.297
LAT. ACELL. ON LOAD	.005	.000
VERT. ACELL. ON LOAD	.266	.020

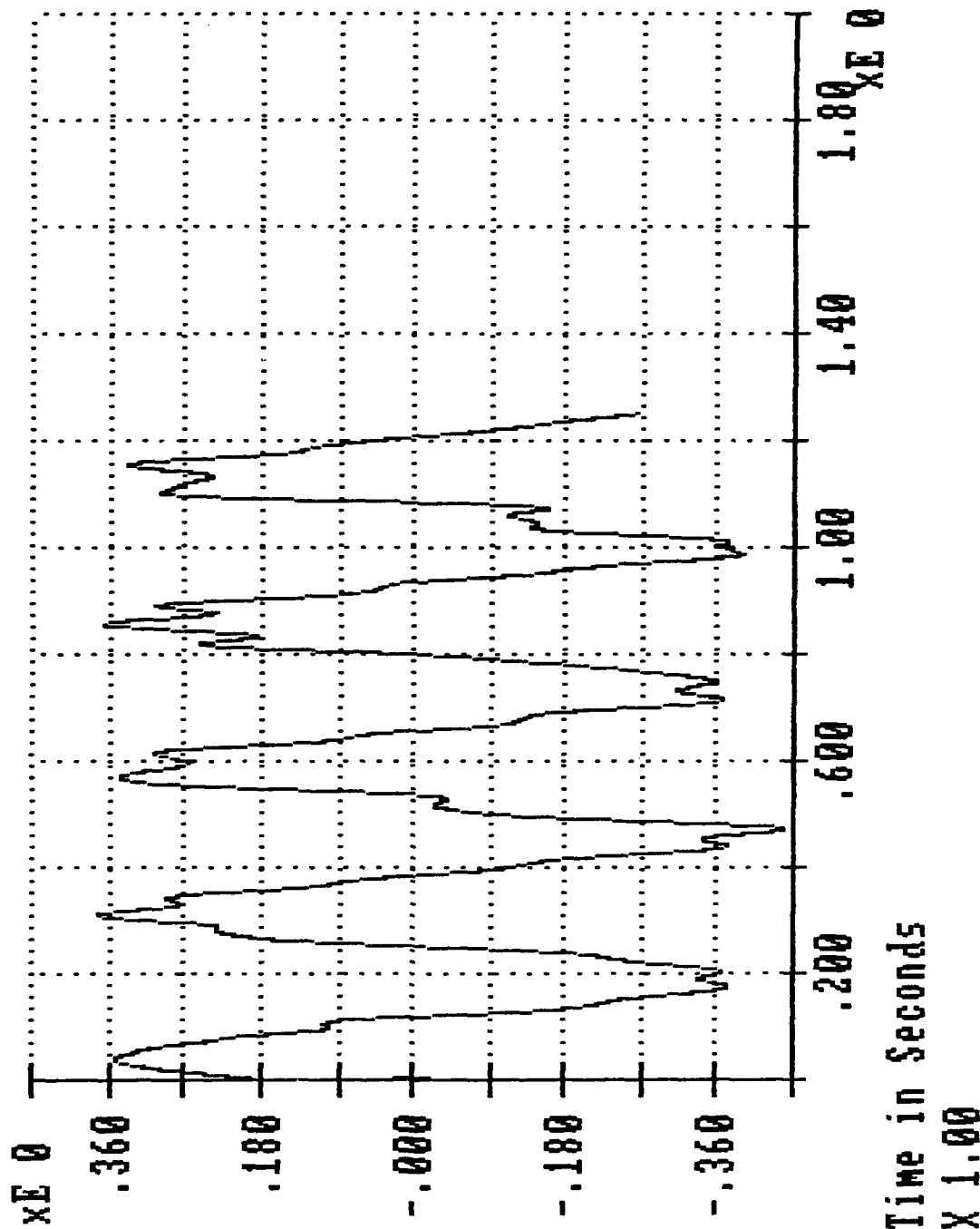
40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 0 Minutes)

LEI
L O N G T G . A B S
A C E L L . O N S H A K I



40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 0 Minutes)

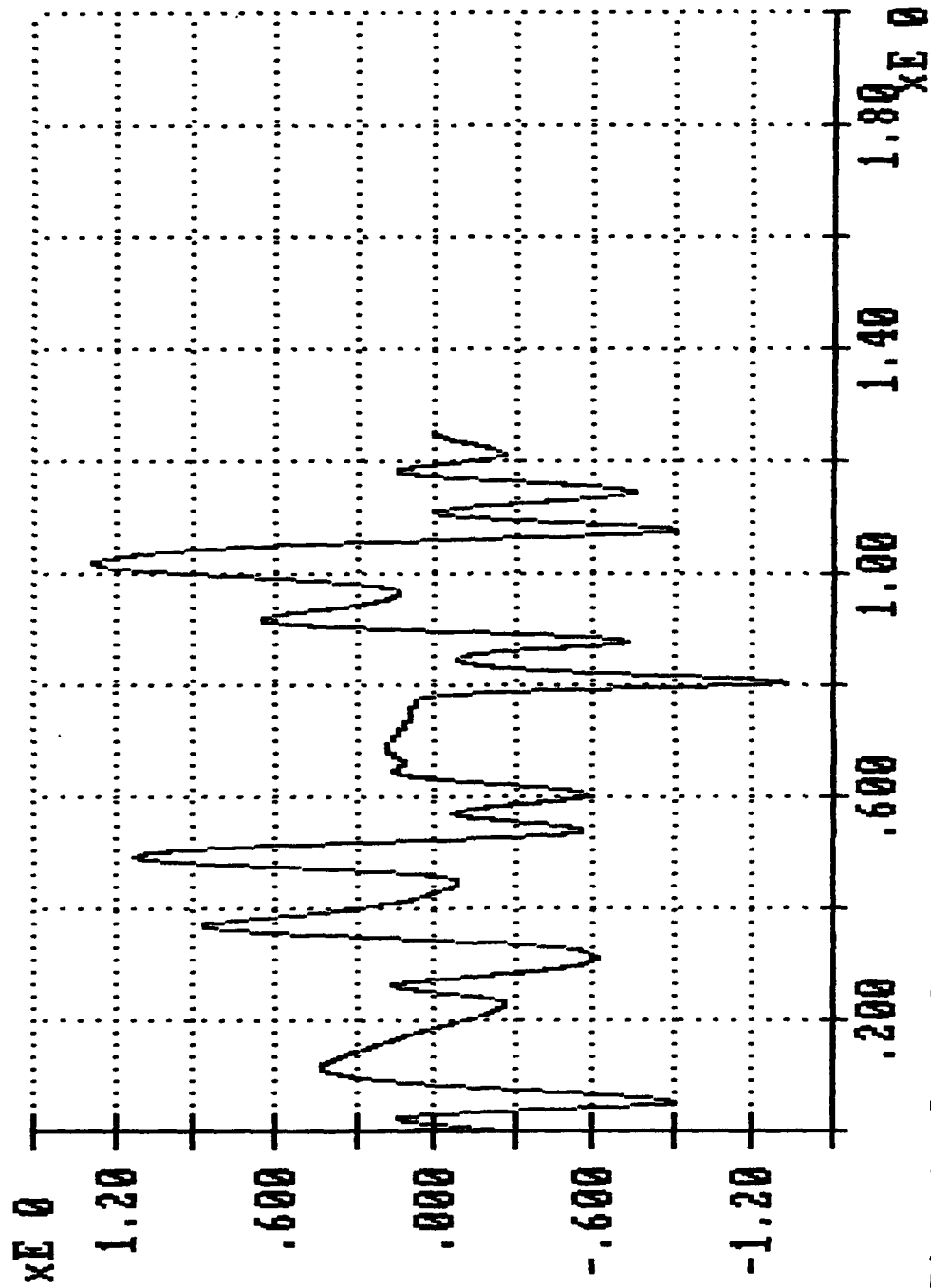
VERTICAL ACCEL. ON SHAKING



40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 0 Minutes)

LONG, S X 1.00

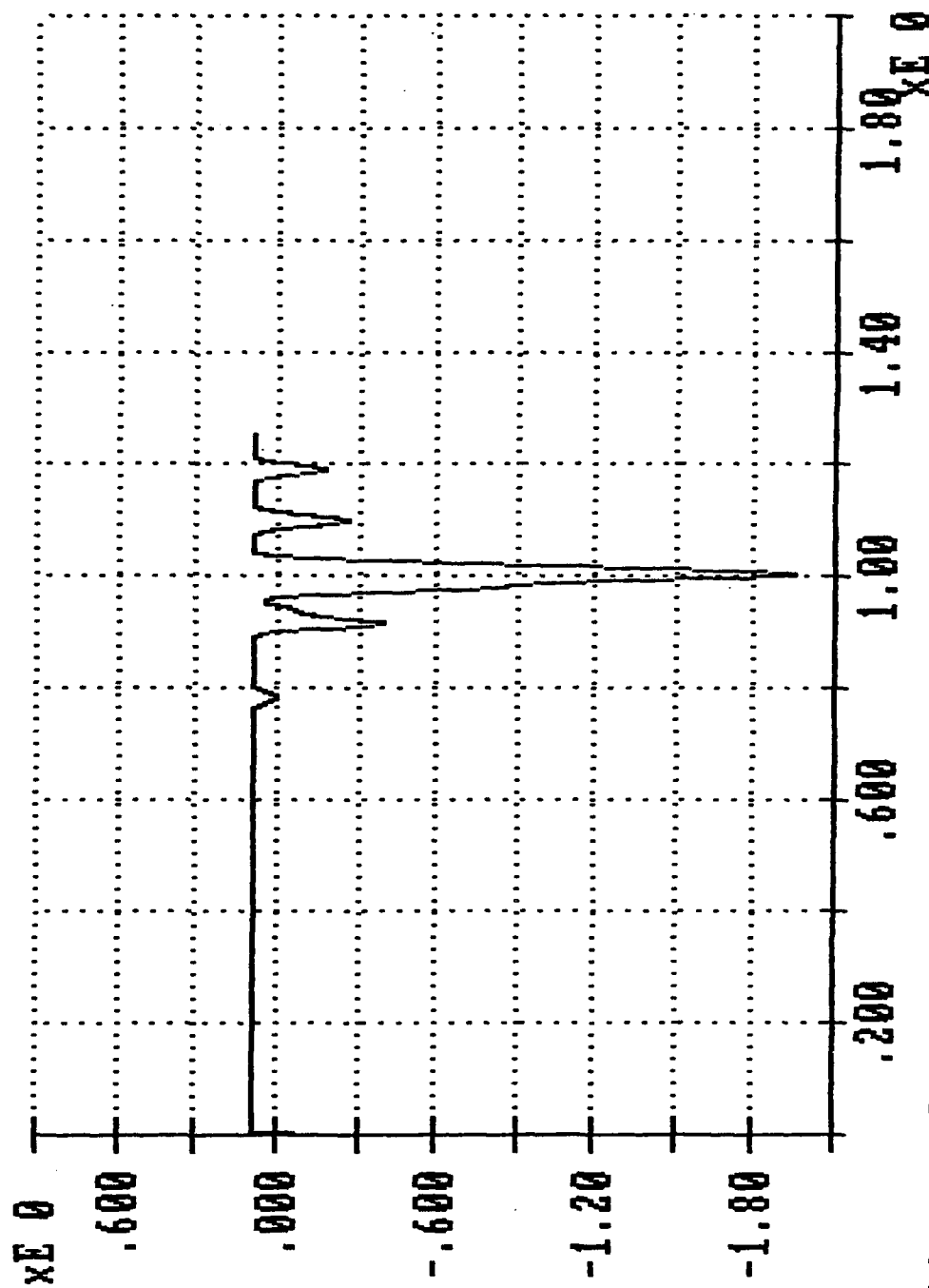
LONG - ACCELL - ON LOAD



Time in Seconds
X 1.00

40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 0 Minutes)

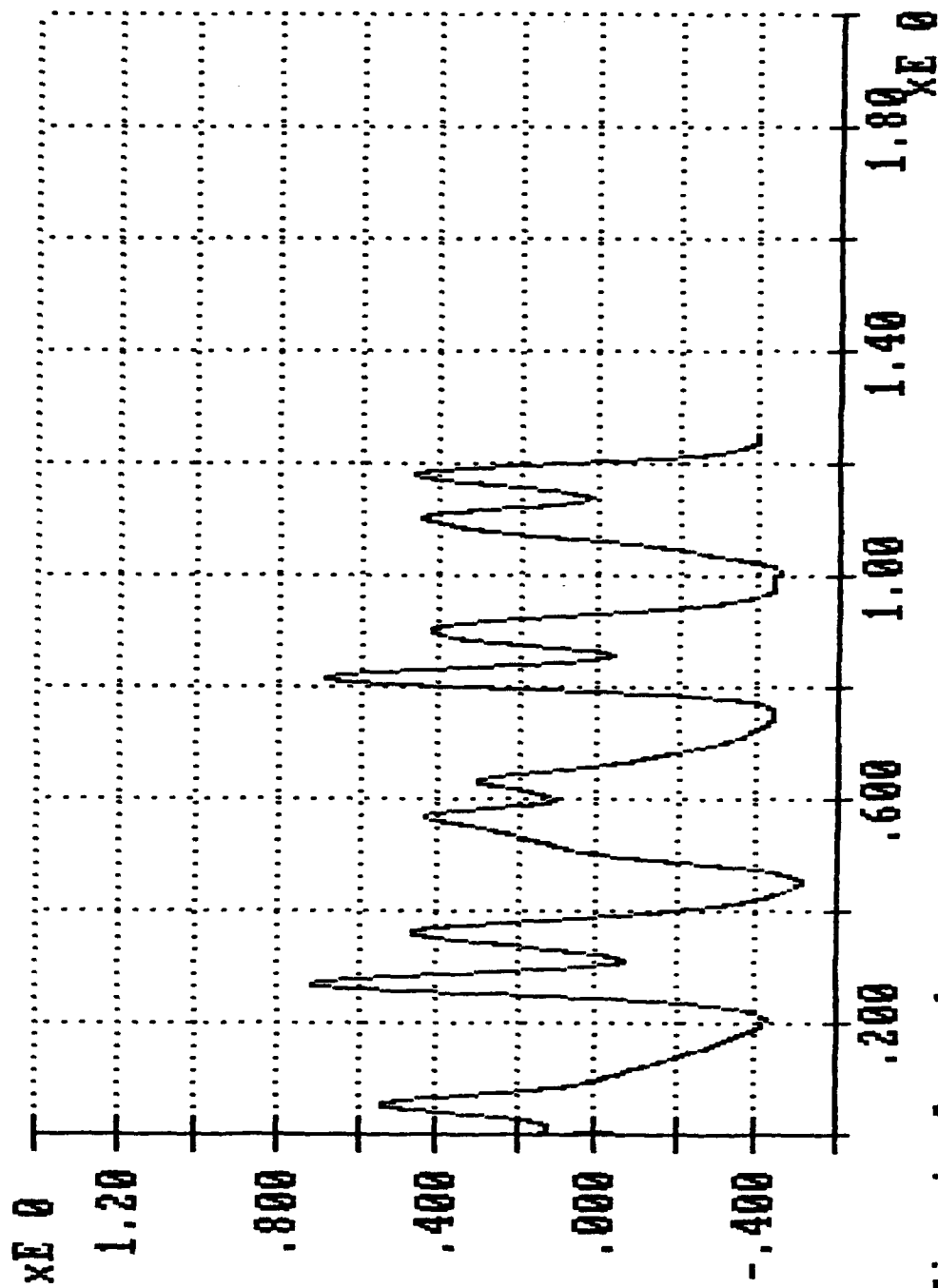
L A T - A C C E L - O N L O A D



Time in Seconds
X 1.00

40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 0 Minutes)

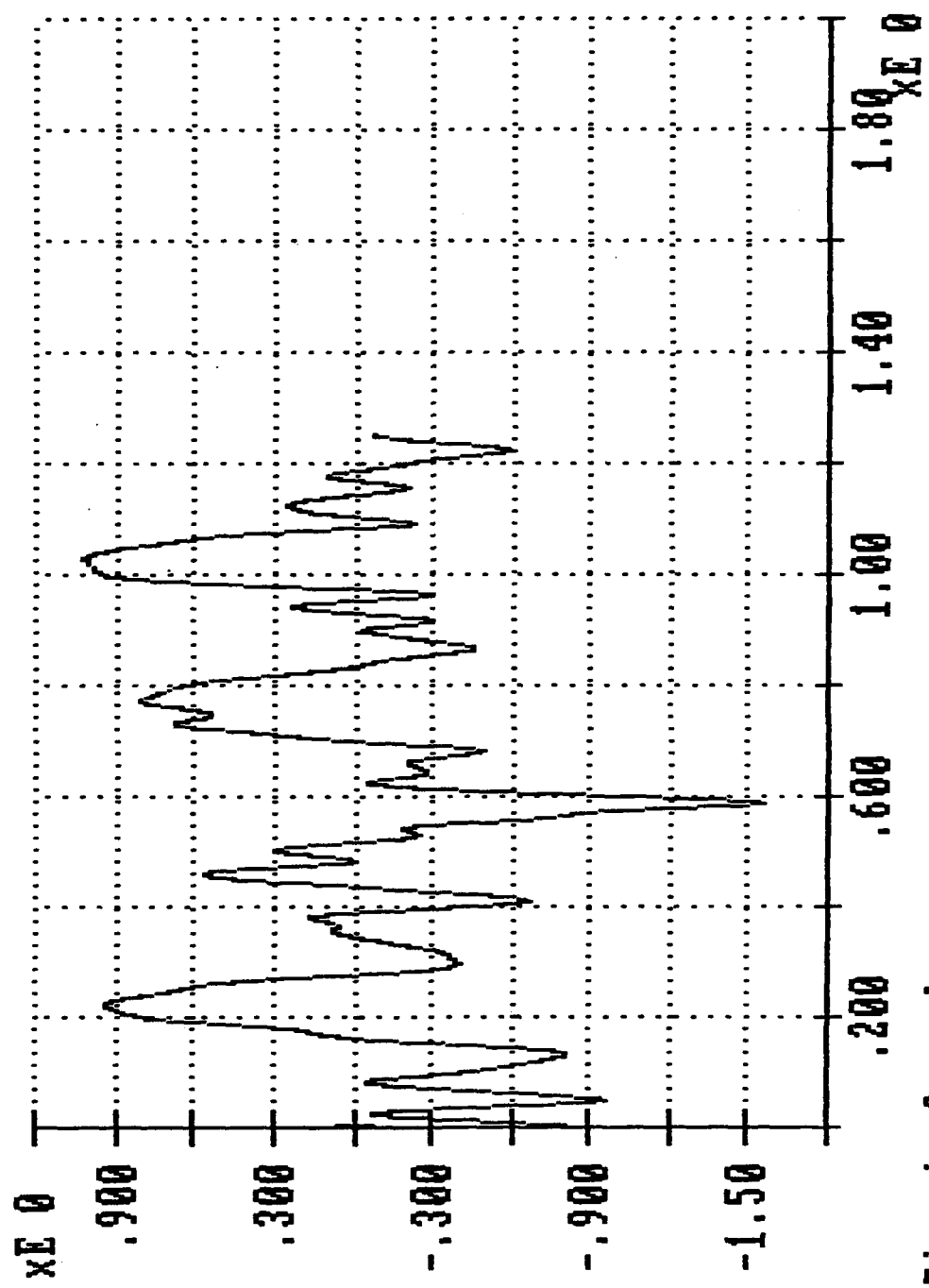
VERTICAL CELL ON LOAD



Time in Seconds
X 1.00

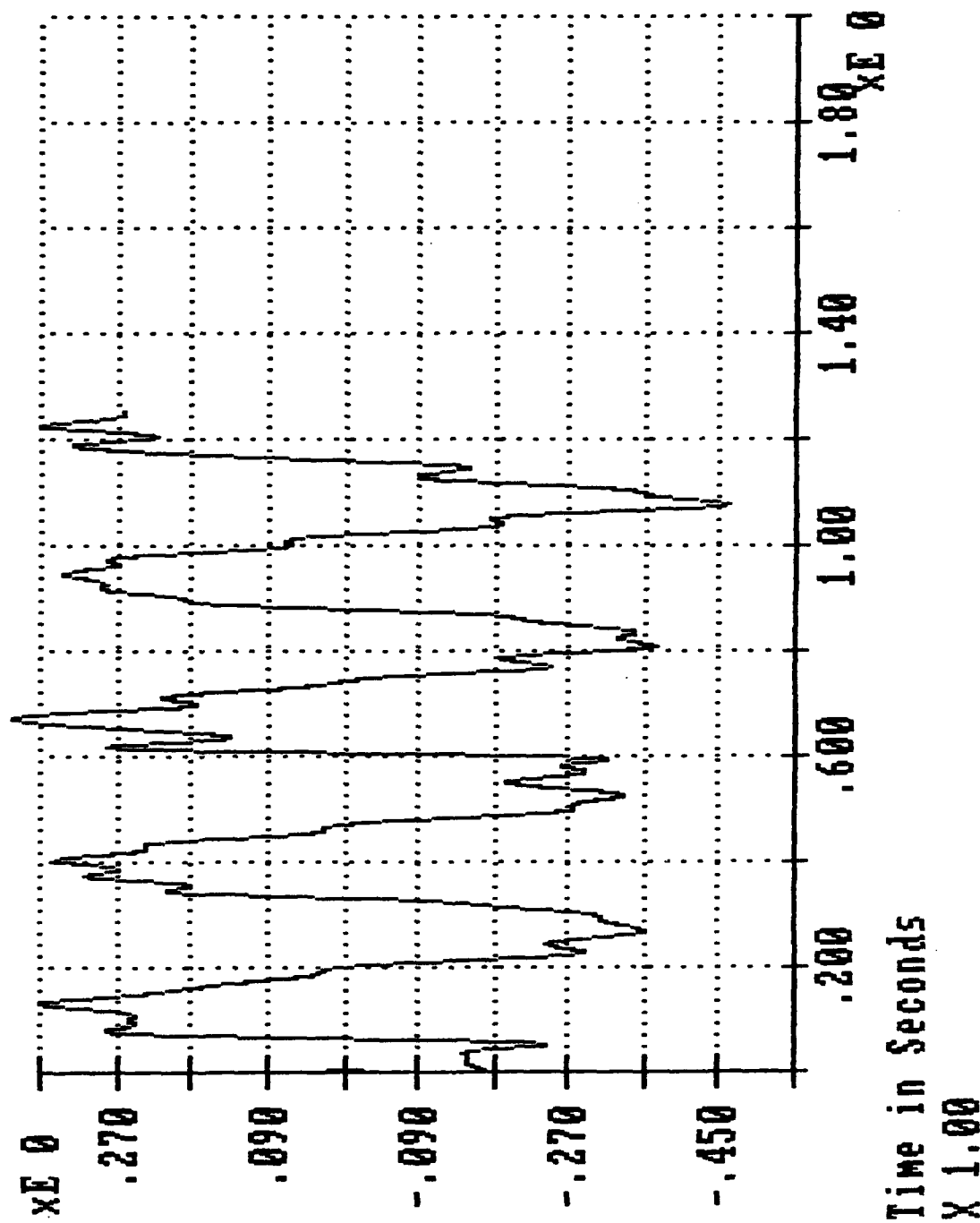
40mm Cans on Standard Metal Pallet in Lateral Position
 (Date: 10-27-87, Time into Test: 22 Minutes)

LONG . ABS CELL . ON SHAK -



40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 22 Minutes)

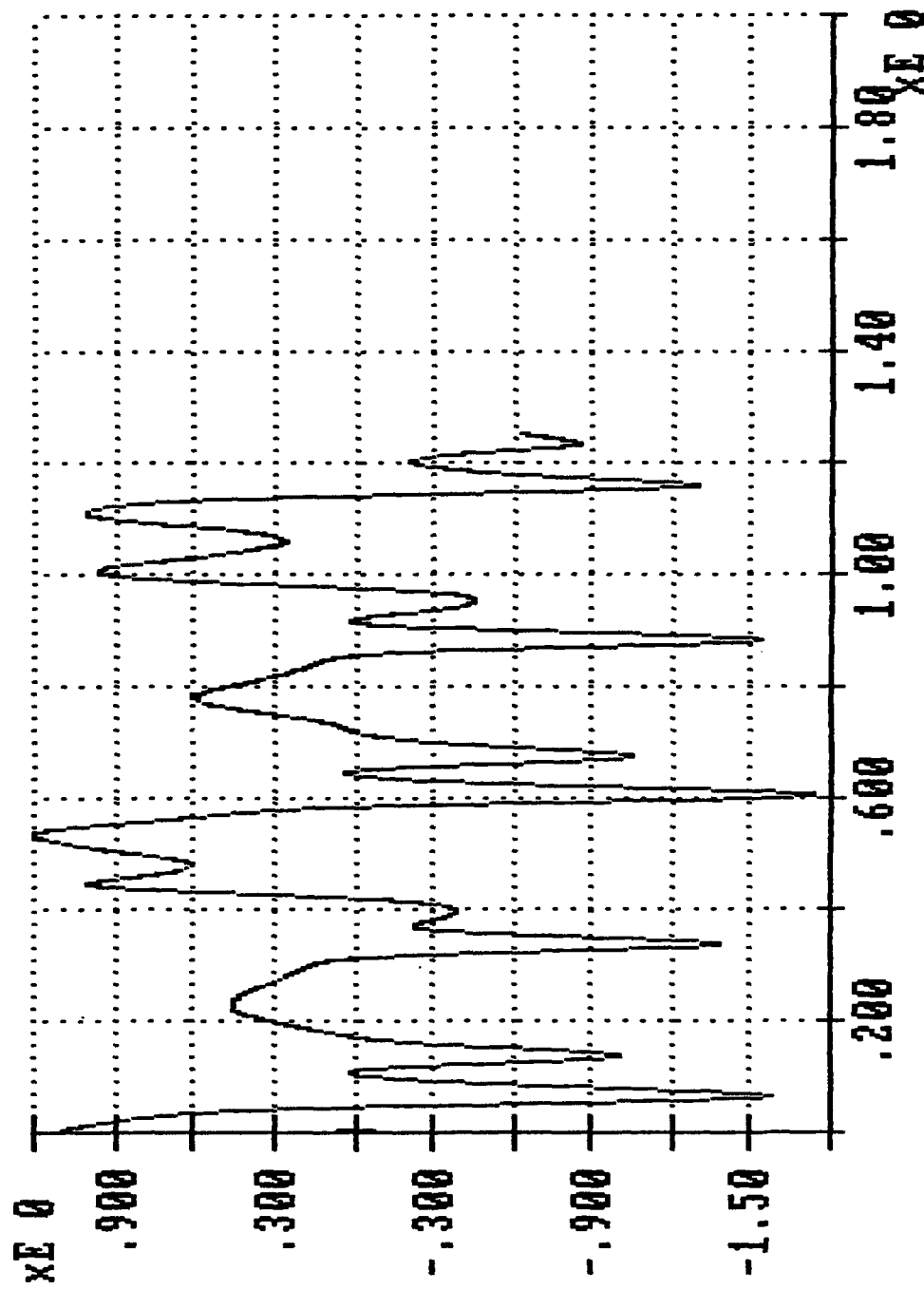
VERTICAL ACCELL. ON SHAKI
VERT. G. ABS. 1.00



40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 22 Minutes)

LONG . S X 1 . 0 0

LONG . ACCEL . ON LOAD

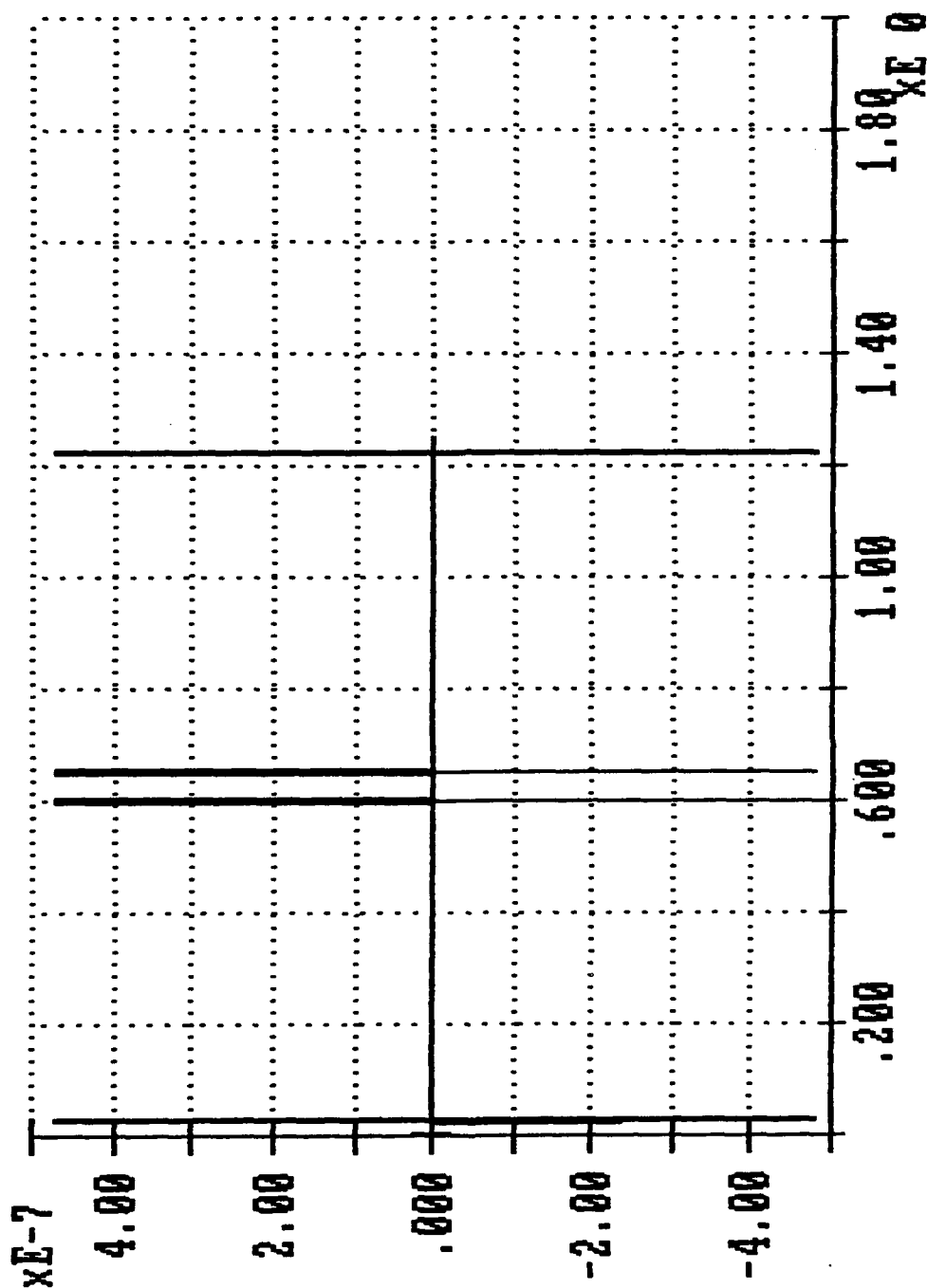


Time in Seconds
 X 1.00

40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 22 Minutes)

1 N G S X 0 0

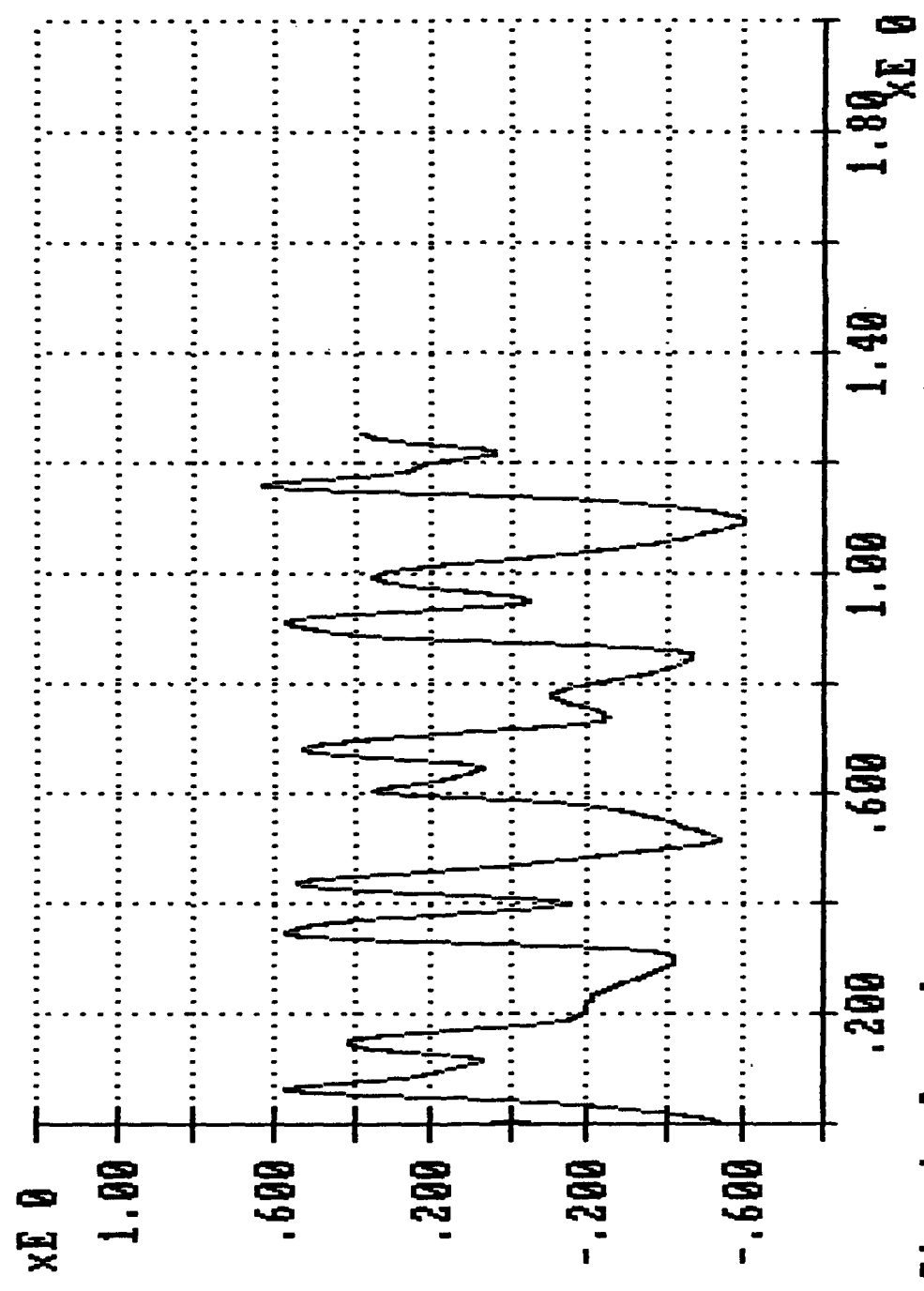
L A T A C E L L O N L O A D



Time in Seconds
X 1.00

VERTICAL ON LOAD
IN G, S X 1.00

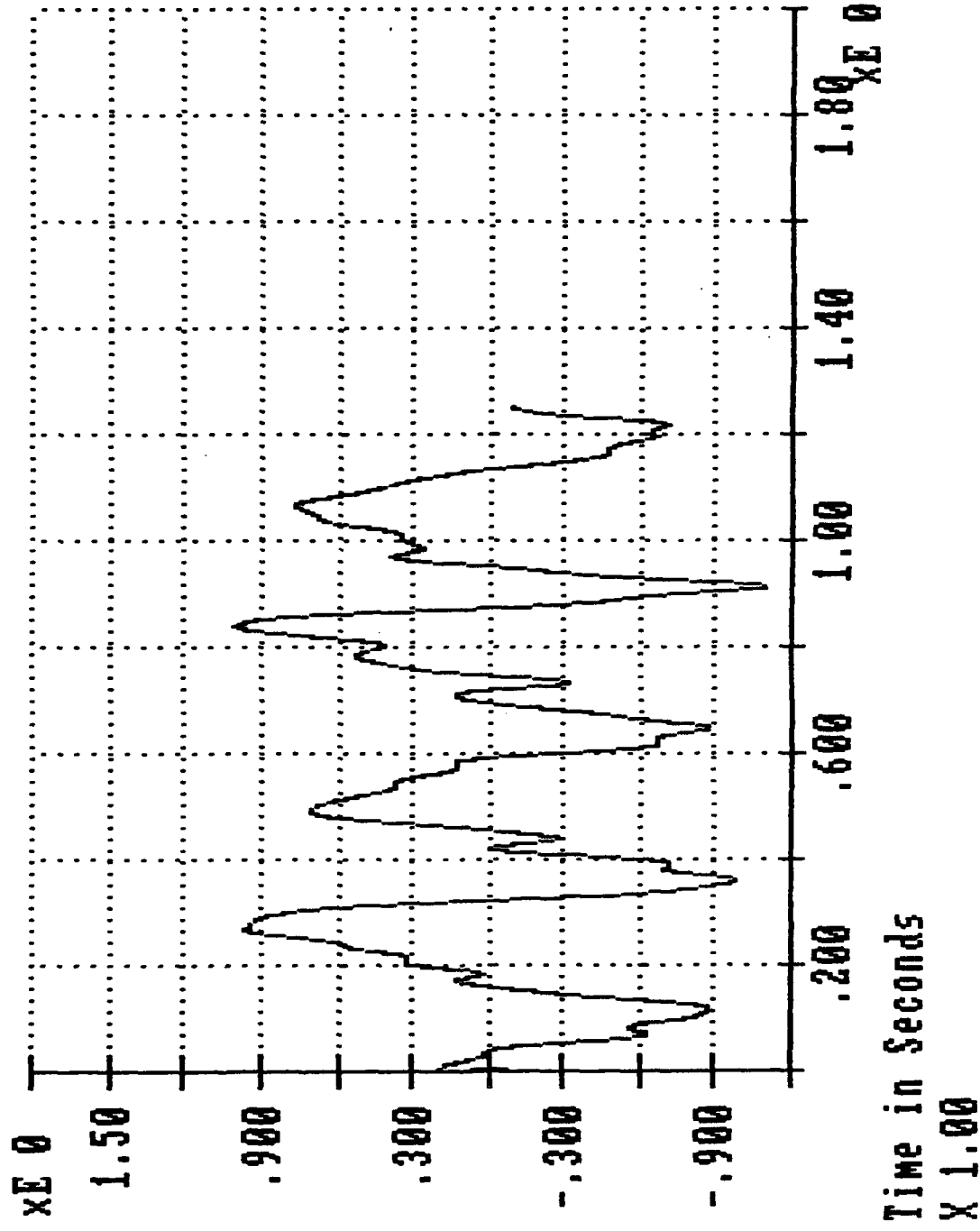
40mm Cans on Standard Metal Pallet in Lateral Position
(Date: 10-27-87, Time into Test: 22 Minutes)



Time in Seconds
X 1.00

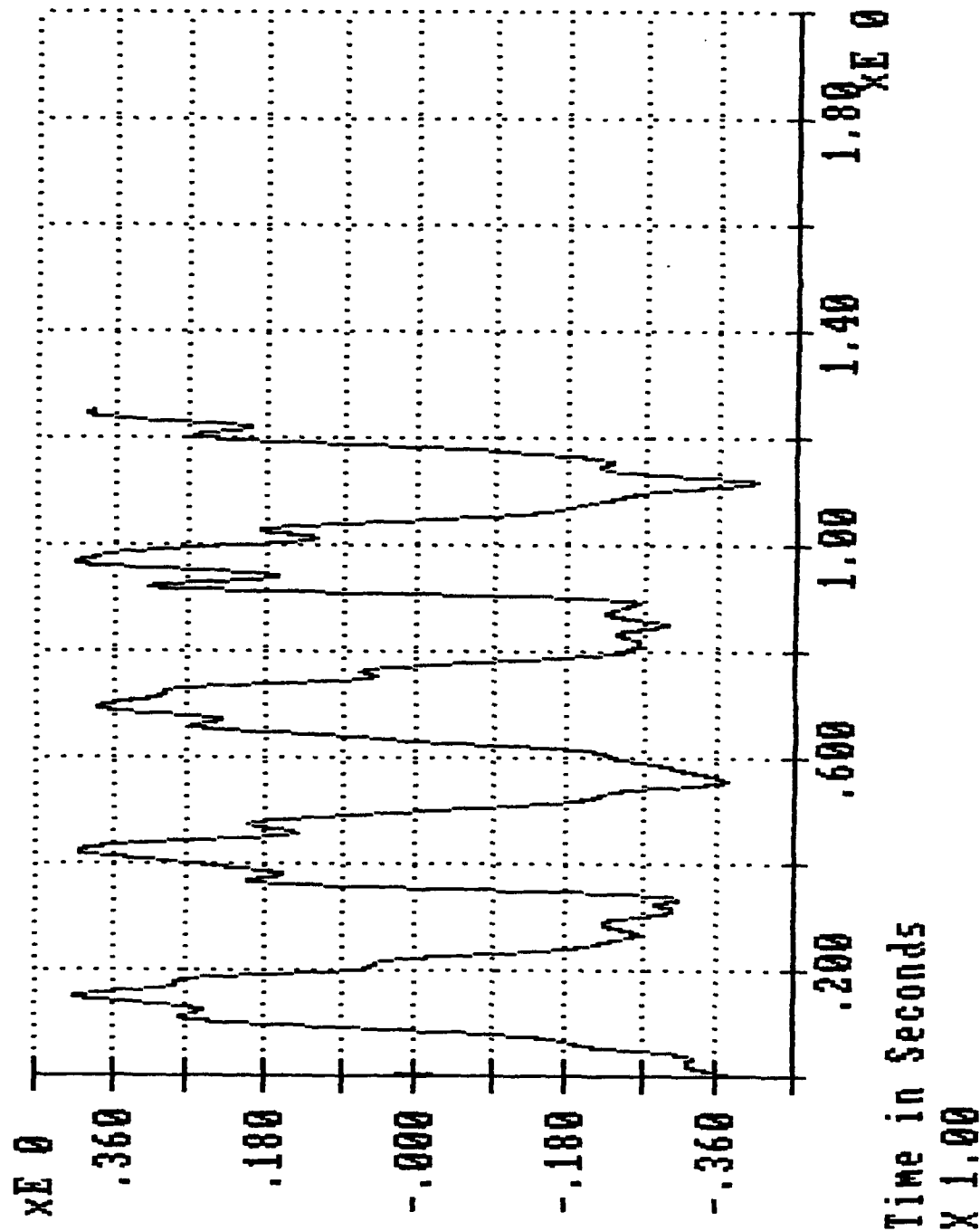
40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 44 Minutes)

LEI LONG . ABS ACCEL . 000 ON SHAKI



40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 44 Minutes)

VERTICAL CELL ON SHAKING

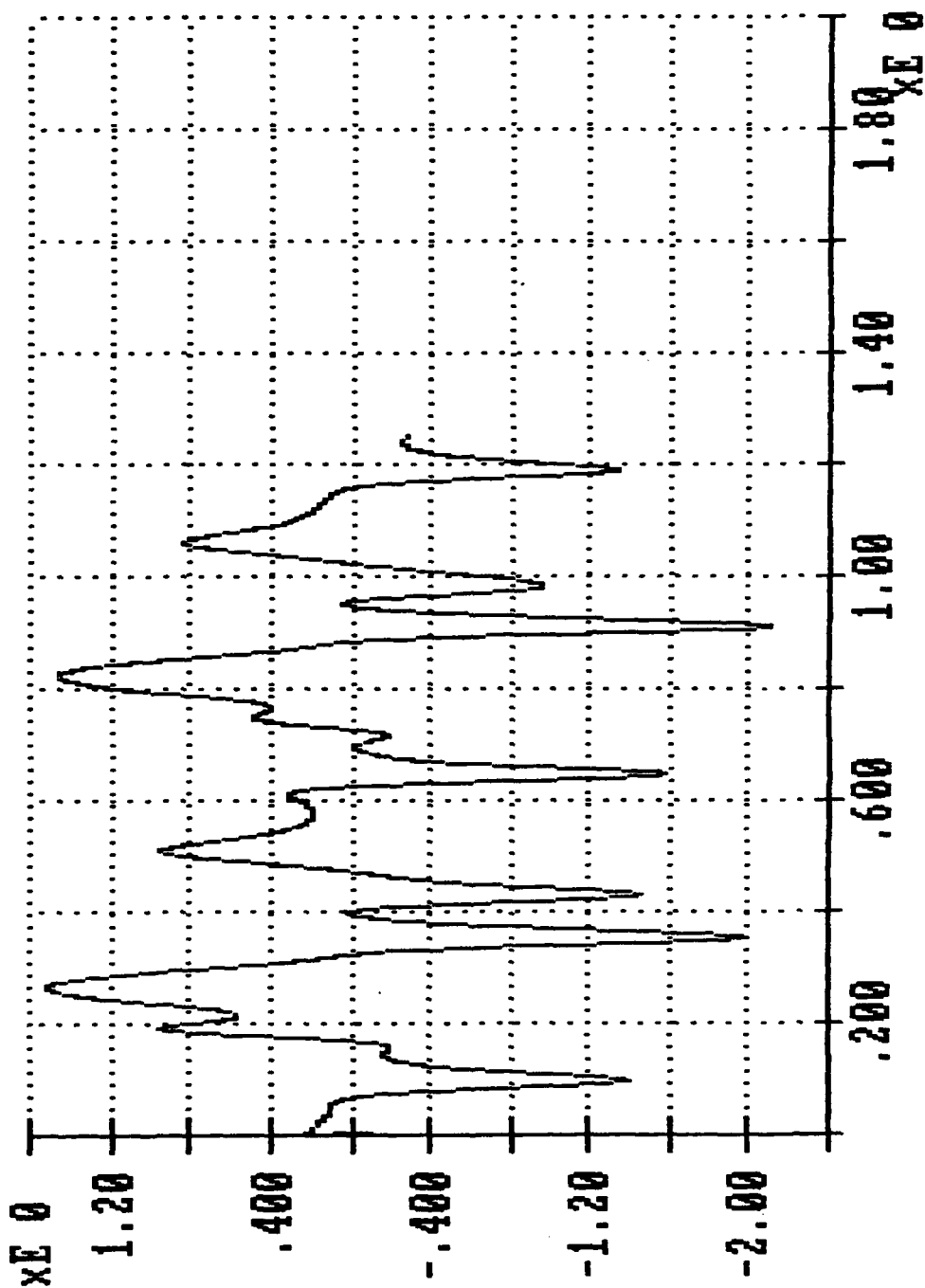


40MM Cans on Standard Metal Pallet in Lateral Position

(Date: 10-27-87, Time into Test: 44 Minutes)

LONG, SIX

CELL ON LOAD



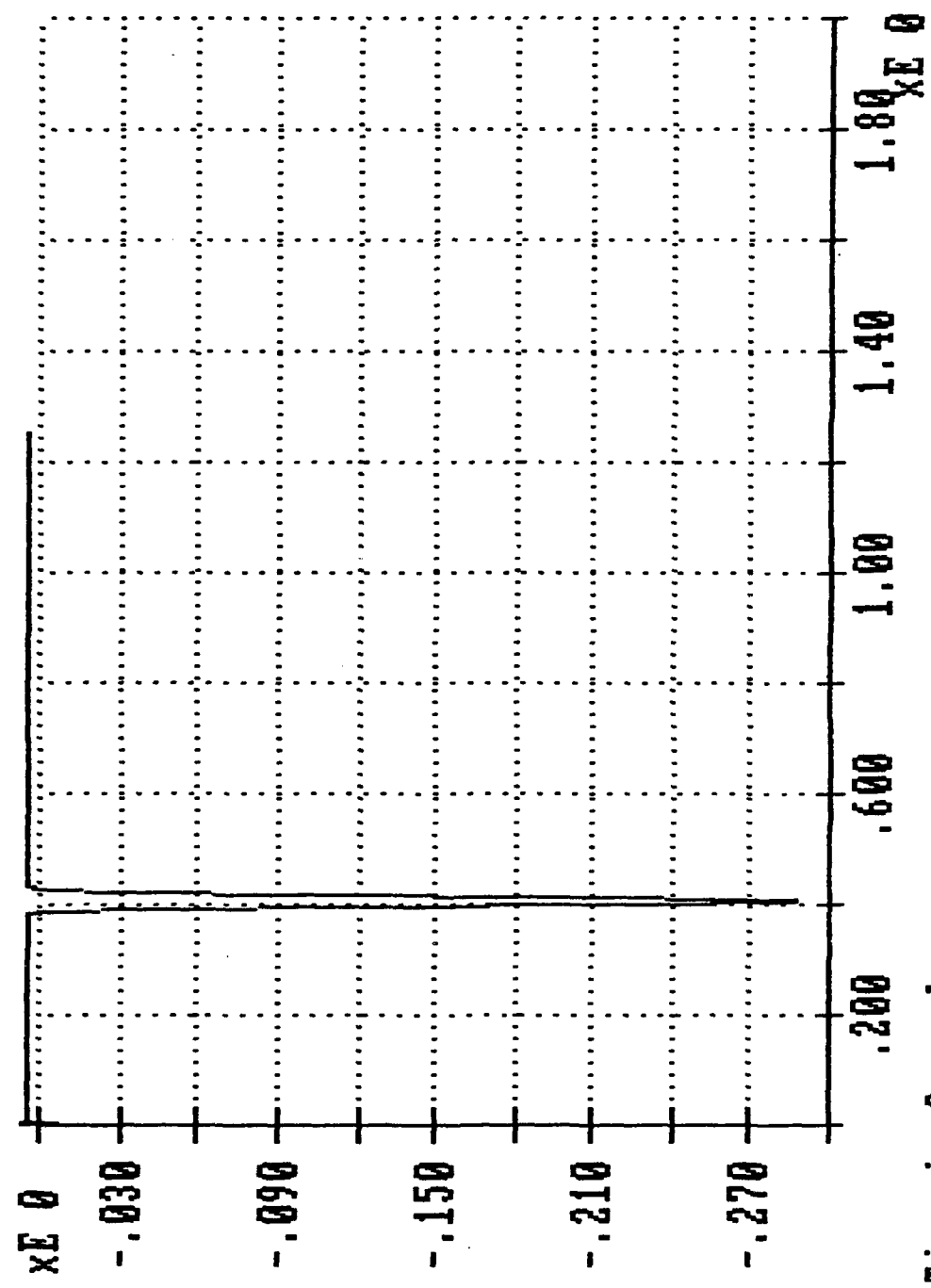
Time in Seconds
X 1.00

40MM Cans on Standard Metal Pallet in Lateral Position

(Date: 10-27-87, Time into Test: 44 Minutes)

IN G S X I . 0 0

L A T . A C E L L . O N L O A D

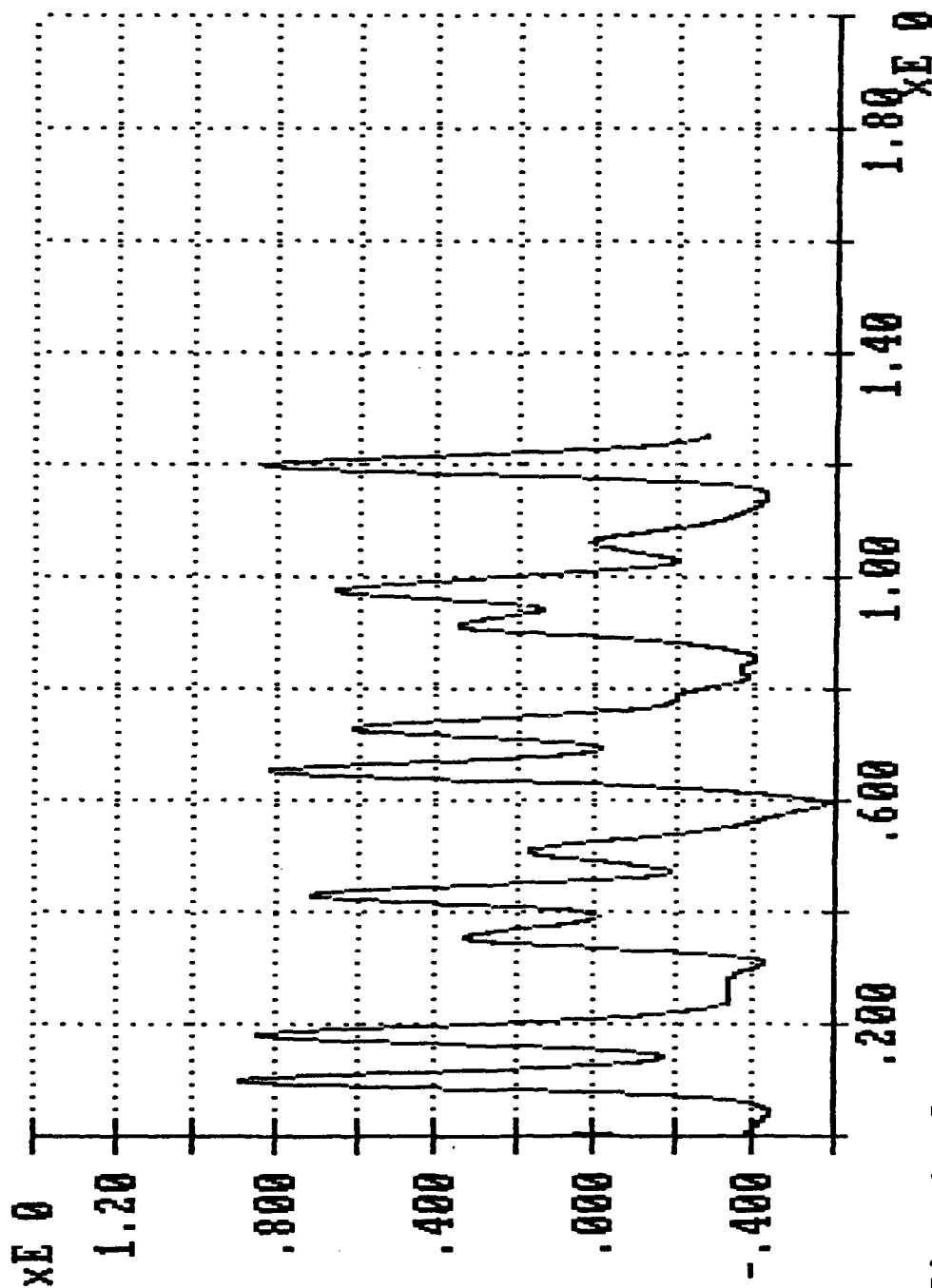


Time in Seconds
X 1.00

40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 44 Minutes)

IN G, S X 1.00

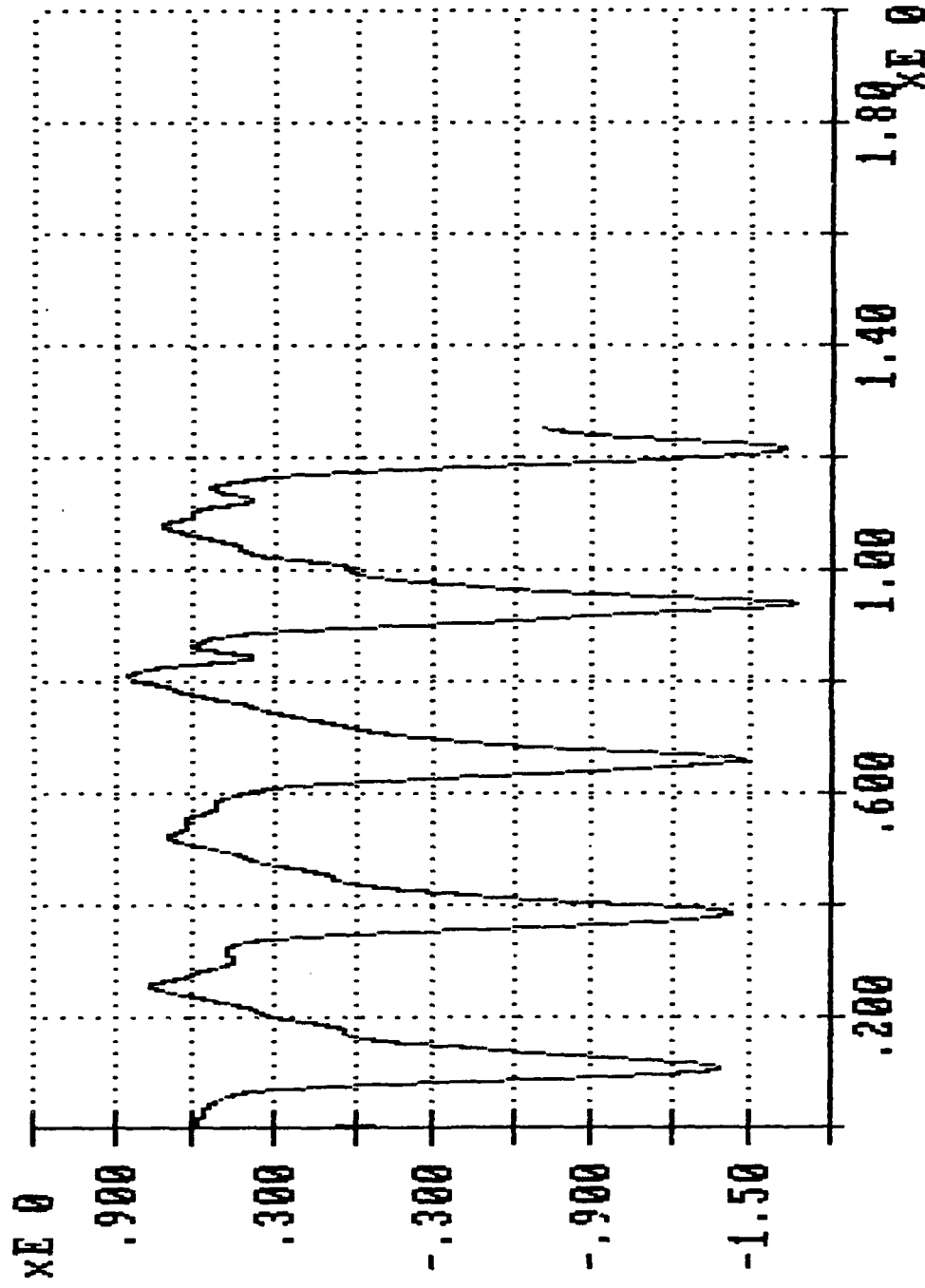
VERT. ACCELL. ON LOAD



Time in Seconds
 X 1.00

40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 66 Minutes)

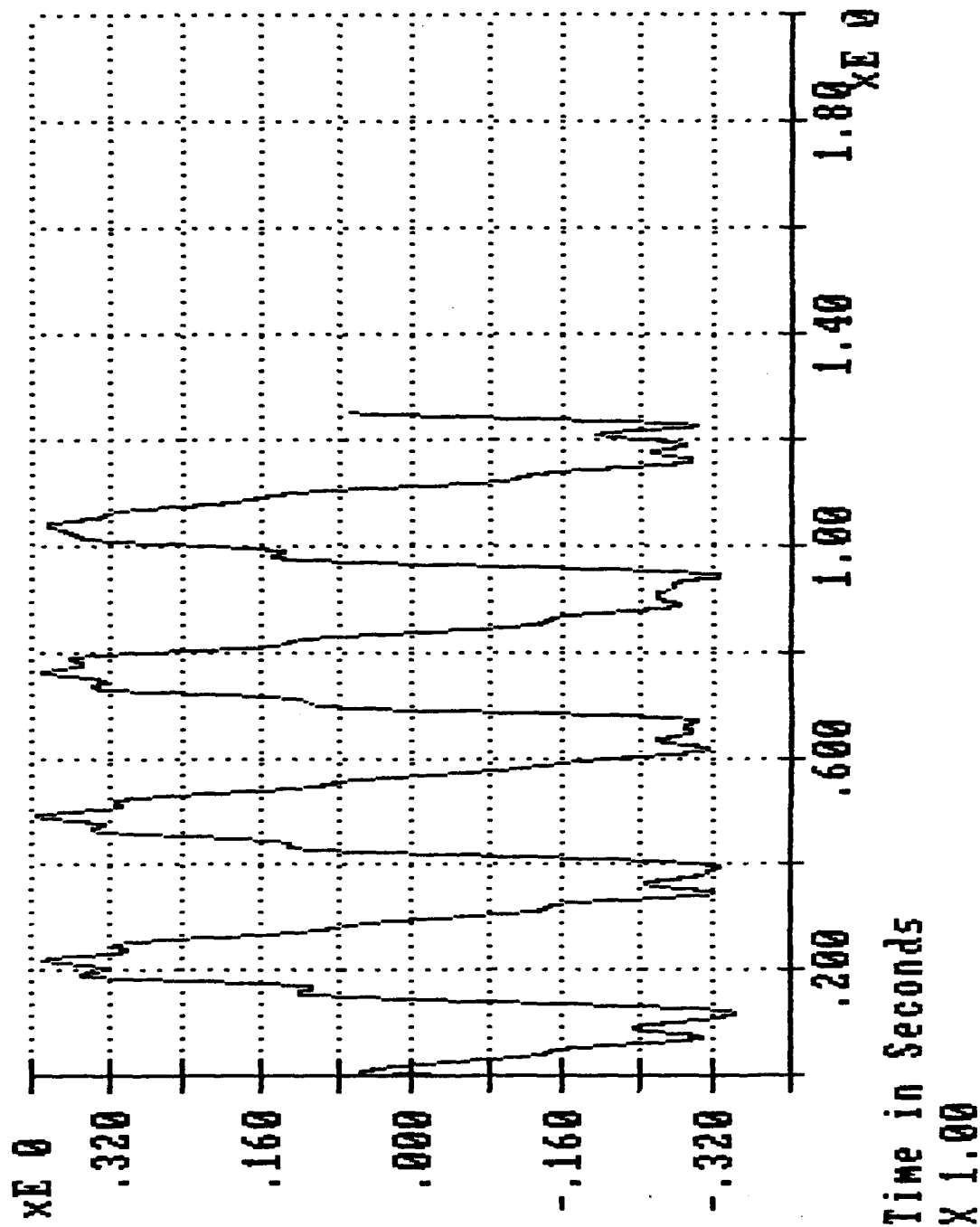
LONG . ACCEL . ON SHAK -



Time in Seconds
 X 1.00

40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 66 Minutes)

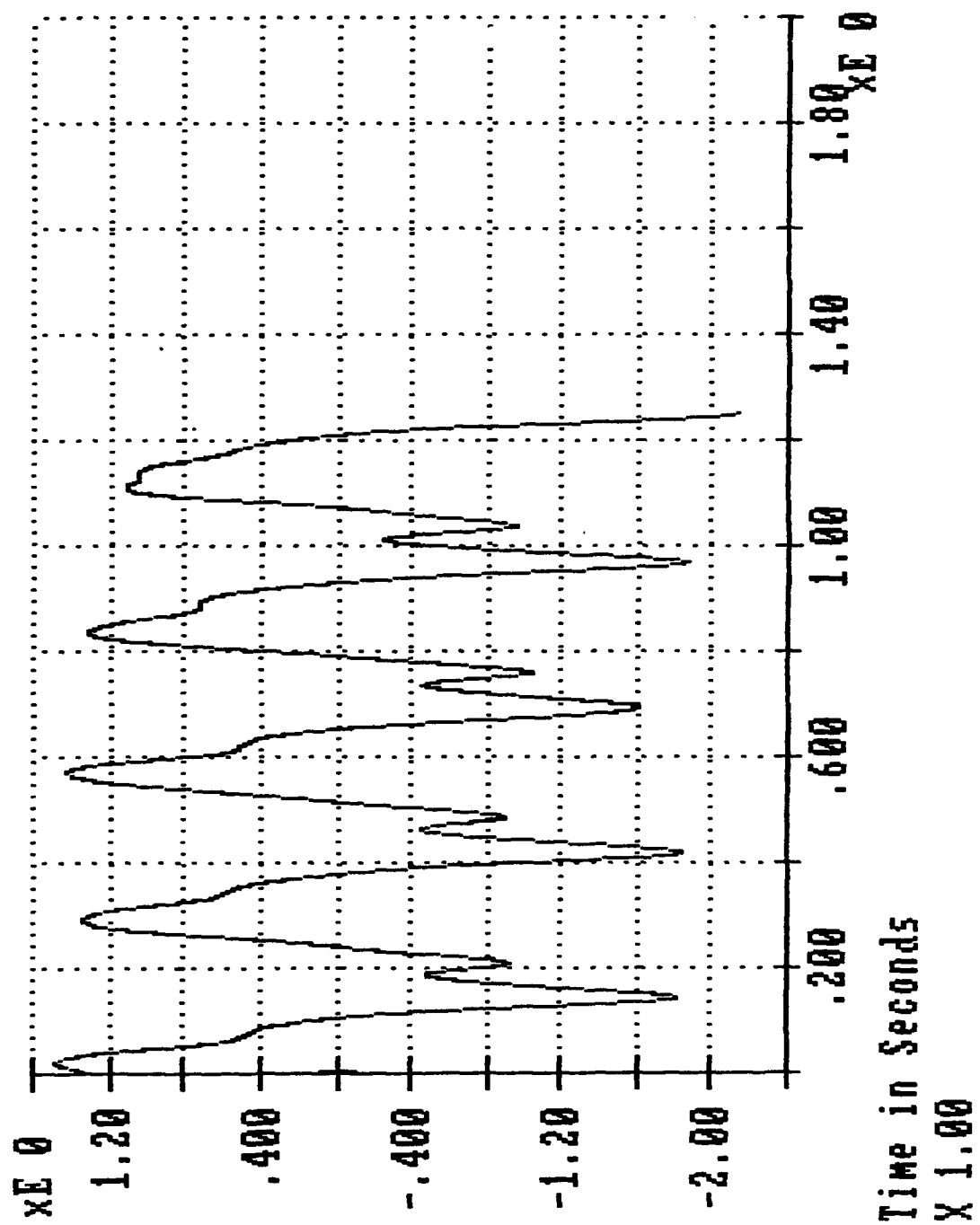
VERTICAL ACCEL 1.00
 ON SHAKING



40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 66 Minutes)

I N G , S X I . 0 0

L O N G . A C E L L . O N L O A D

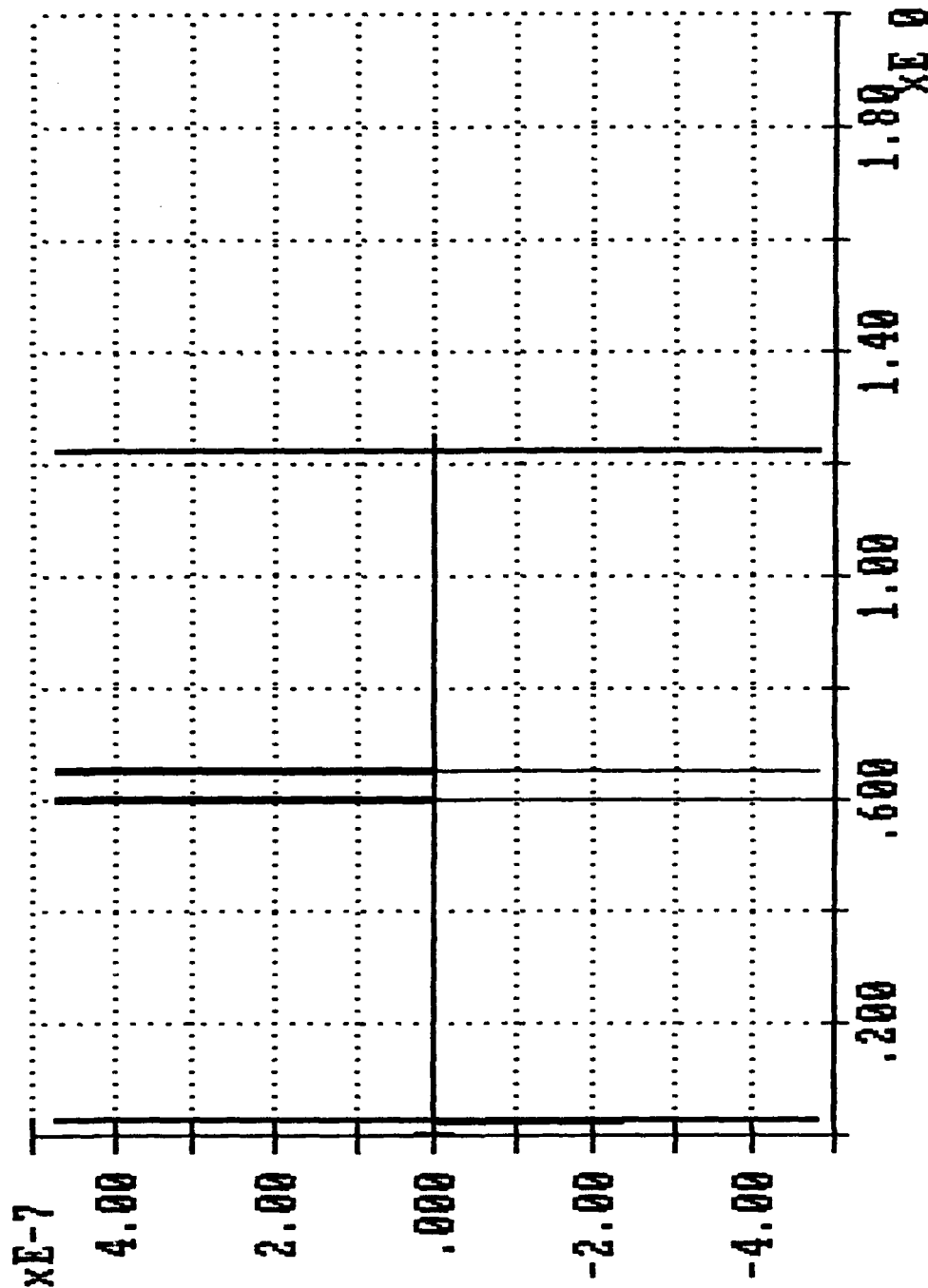


40MM Cans on Standard Metal Pallet in Lateral Position

(Date: 10-27-87, Time into Test: 66 Minutes)

IN G, S X . 0 0

L A T . A C E L L . O N L O A D

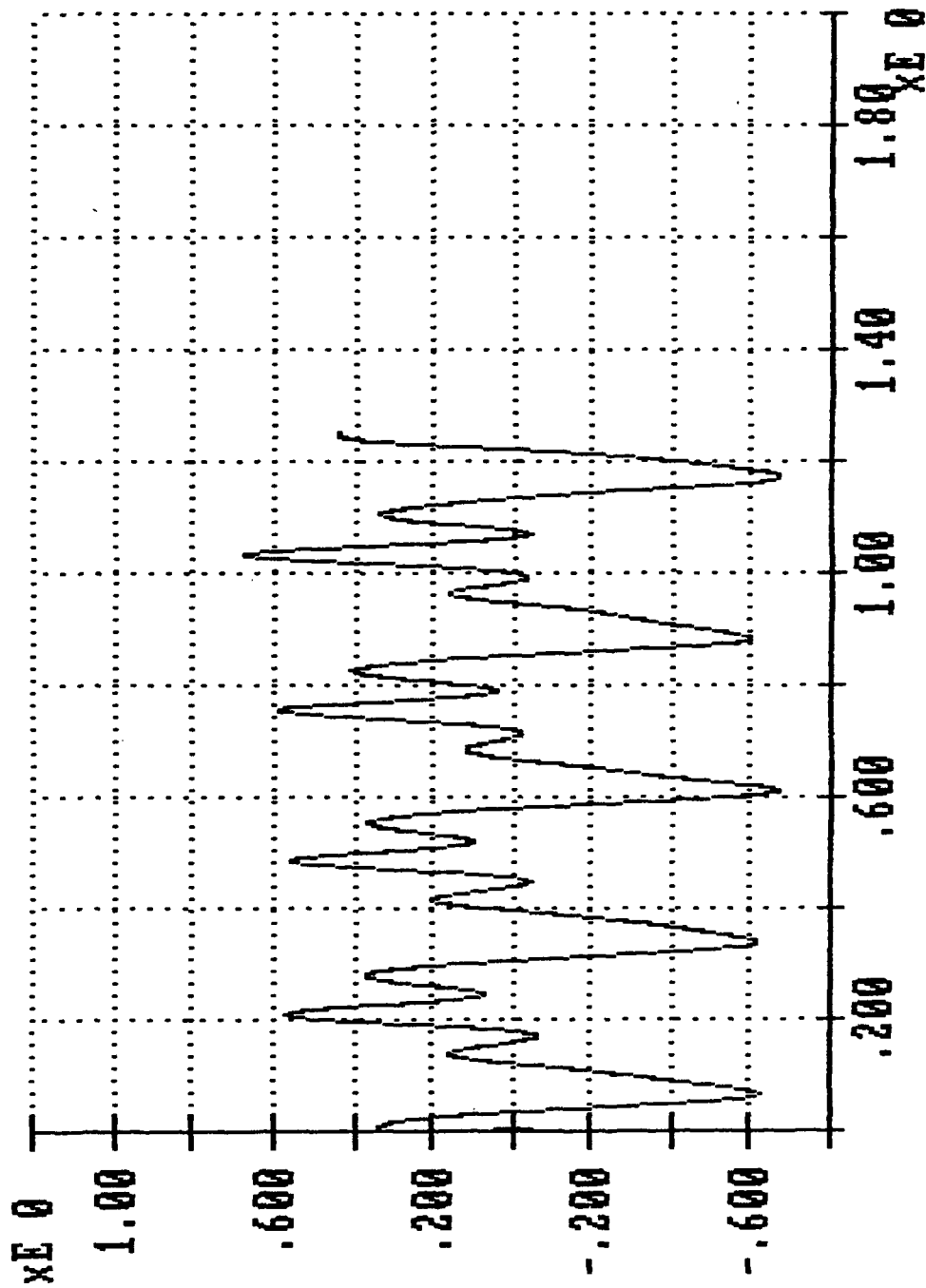


Time in Seconds
x 1.00

40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 66 Minutes)

IN G, S X 1.00

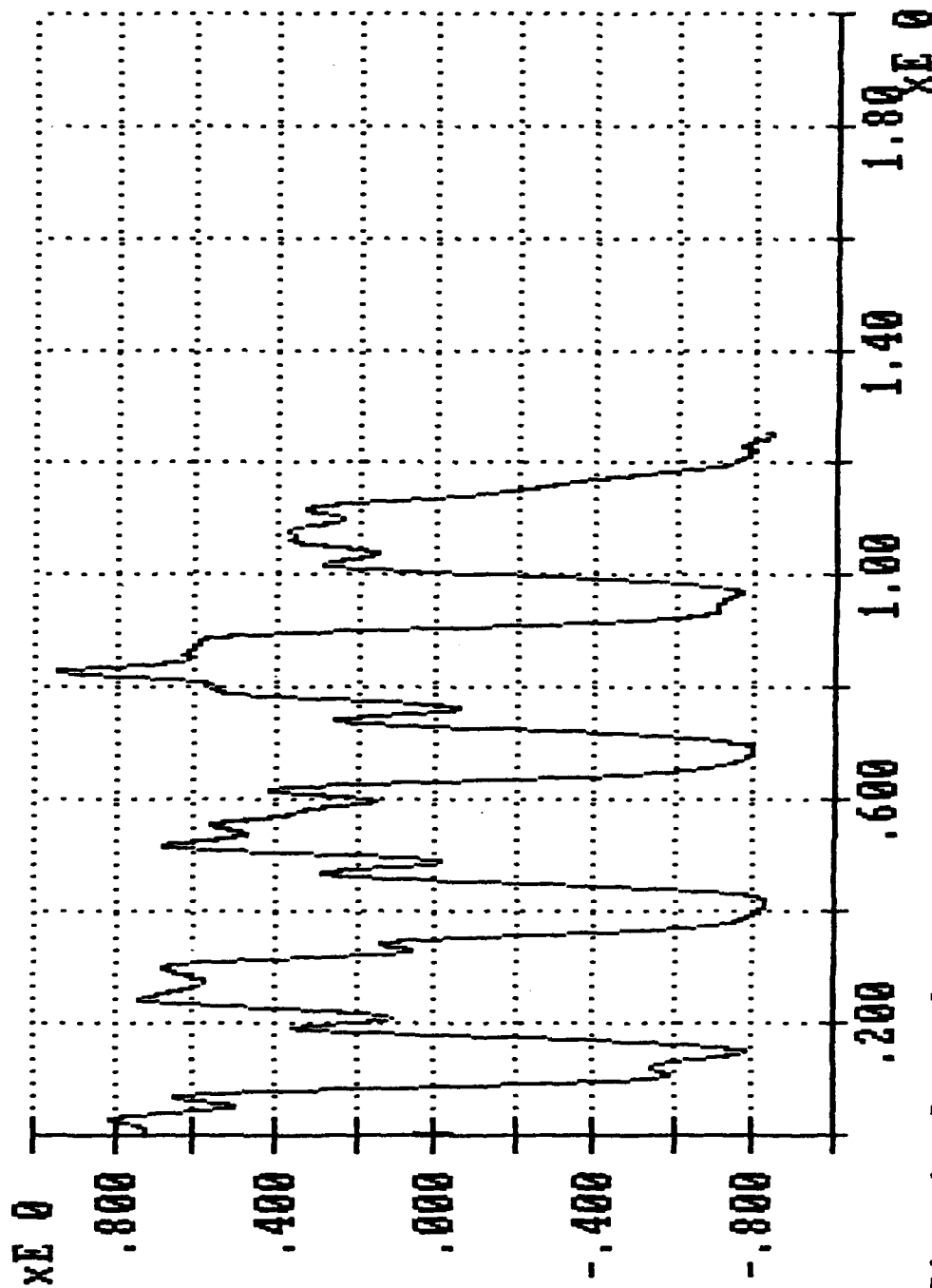
VERT. ACCEL. ON LOAD



Time in Seconds
 X 1.00

40mm Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 88 Minutes)

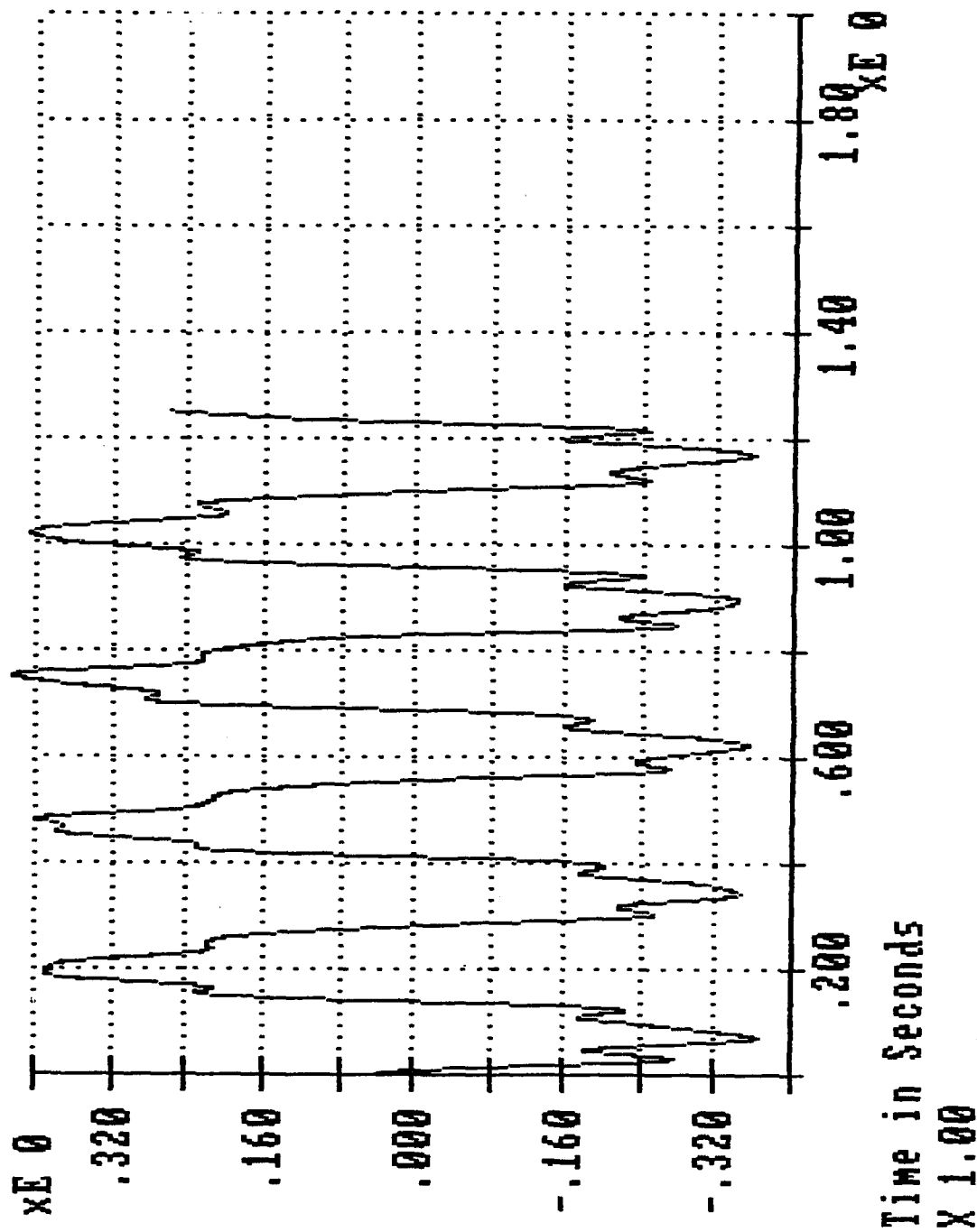
LONG . ACCEL . ON SHAK :



Time in Seconds
X 1.00

40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 88 Minutes)

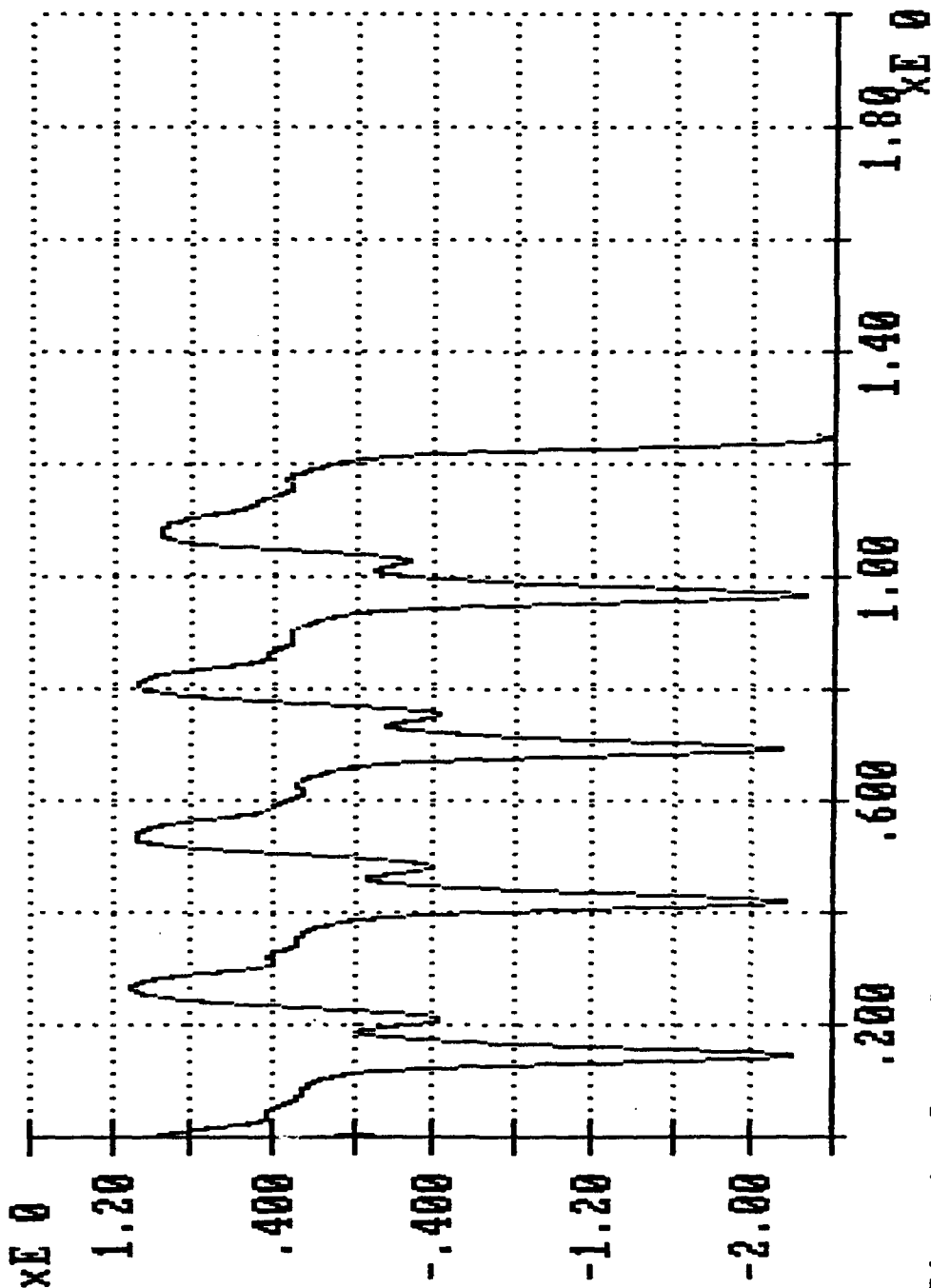
VERTICAL ACCEL. ON SHAK. :
UERN TG . ABS LEX 1 . 0 0



40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 88 Minutes)

LONG, SIX

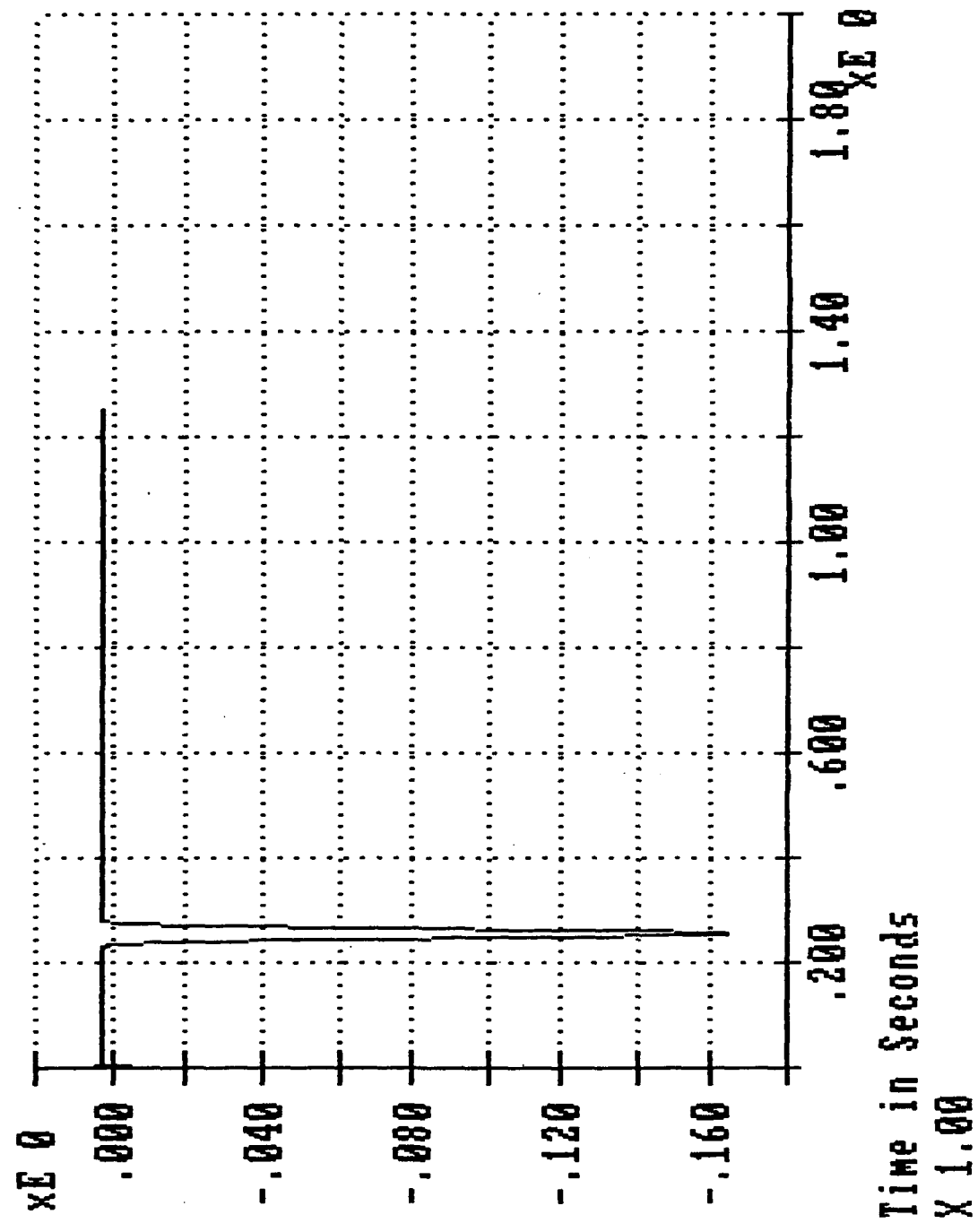
LONG - ACCEL - ON LOAD



Time in Seconds
 X 1.00

L A T . A C C E L L . O N L O A D
I N G , S X I . 0 0

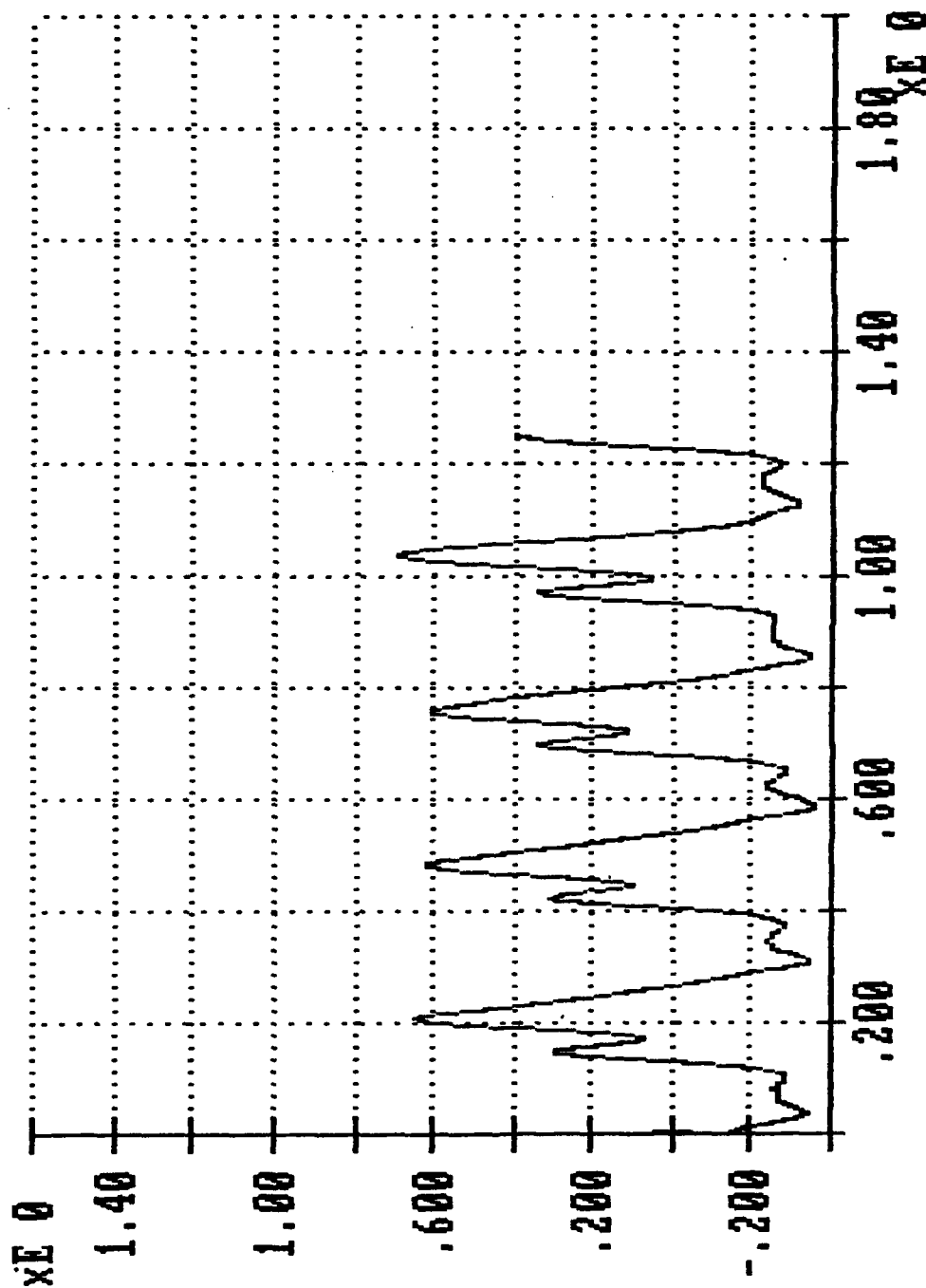
40MM Cans on Standard Metal Pallet in Lateral Position
(Date: 10-27-87, Time into Test: 88 Minutes)



40MM Cans on Standard Metal Pallet in Lateral Position (Date: 10-27-87, Time into Test: 88 Minutes)

VERTICAL ACCELL ON LOAD

IN G, S X 1.00



Time in Seconds
 X 1.00